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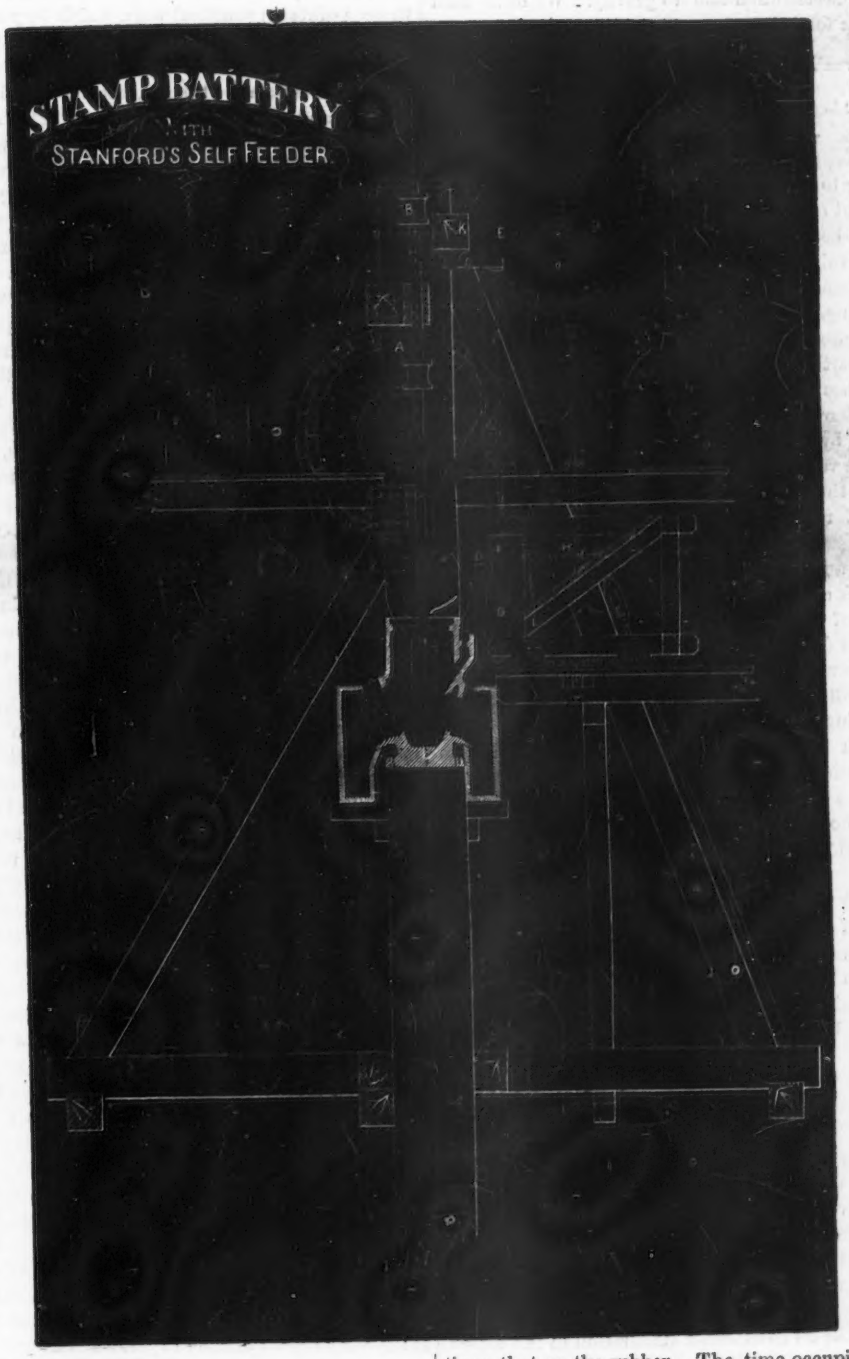
American Amalgamating Machinery—Stanford's Self Feeder.

Were the importance of automatic battery feeders confined to the saving of labor, they would probably find no very extensive use, for although the business of milling is one that requires the closest scrutiny and economy, the one workman employed in each working shift for the feeding of 15 or 20 stamps is not an item of expense sufficiently heavy to warrant in all cases the introduction of the large and somewhat cumbersome apparatus necessary when the machine is to do its own feeding. But these automatic arrangements work with a regularity, a precision, and an attention to duty which is matched only by the most faithful laborers.

Mr. C. P. STANFORD has devised a Feeder, which is now manufactured by the Union Iron Works, Messrs. H. J. BOOTH & Co., San Francisco. The removal of ore from under the stamp by powdering and washing through the screen, lets a tappet, B, on the stem, A, down on a lever, C. The motion is communicated to the feeding screen and a small quantity of ore is thrown into the battery, the action continuing until the ore on the die has accumulated to such a height that the tappet no longer touches the lever in its fall. This tappet is usually placed on only one stamp in a battery —usually the middle one. The tappet being adjustable, allows the rapid alteration of the quantity of ore thrown down by the feeder in a given time.

Our illustration shows the application of this Feeder to a battery for silver ore crushing dry. The powdered ore passing through the screens falls into side boxes, in which works a worm, or some similar "traveller," which conveys it to the proper receptacle.



Influence of the Velocity of Impact on the Effective Duty of Stamps.

BY WILLIAM MAIN, JR.

It is well known that but a fraction of the mechanical work expended in lifting stamps, is usefully employed in the fall, also that the value of this effective fraction varies between wide limits. The total amount of power developed in the fall, may be divided into two portions: first, that usefully expended in actual crushing; second, that which is wasted, in jarring the foundation, and in heat. The heat is produced both by friction and by force of compression, not expended in fracture. The most economical work would be performed, when the blow is exactly sufficient to crush the rock with a minimum of jar communicated to the mortar bed. A fragment of rock may be just strong enough to resist the blow of a stamp; the whole force of the blow will be transmitted through it to the foundation. A slightly harder blow or smaller piece of rock, would have caused a useful expenditure of power in breaking the rock to fragments, leaving a smaller residue for useless vibrations.

Stamps may be classed under two heads. First, those with a free fall. Second, those whose fall is accelerated by a force added to that of gravity. The latter division includes all those of which the fall is accelerated by the pressure of steam, air or springs.

The same amount of mechanical power may be expended in raising a heavy stamp a certain height, or in raising a lighter stamp to a proportionally greater height, or in raising a light stamp to the height of the heavy stamp, and then accelerating its fall by a pressure equal to the difference of weight. In all these cases the amount of power expended is the same, while the useful effect will be different.

It must be distinctly realized that all solid bodies, however hard, are to some extent elastic, and therefore capable of compression, within certain limits, without fracture. A body is *harder* as the resistance it offers to change of shape is greater; more *brittle* as the limits are narrower, within which change of shape may be effected without fracture. A stamp falling on a block of rubber may cause a depression of three inches; falling on a block of granite, a depression of 1-50 of an inch. The pressure to which the blow is equivalent is inversely proportional to the depth of compression. The pressure on the granite will be 150 times that on the rubber. The time occupied in effecting this depression will, according to the laws of retarded motion, be twice that occupied by the stamp in passing freely, at its maximum velocity, over an equal space. In striking the rubber block, the stamp will be brought to rest in a time during which, at its maximum of velocity, it would have fallen six inches. Striking the granite block, effecting a depression of 1-50 of an inch, it is brought to rest in a space of time during which it would have fallen 1-25 of an inch, had the block not been there.

A stamp which has fallen freely 15 inches, will have attained a velocity of nine feet per second (very nearly), and will be arrested by the rubber in 1-18th of a

second, by the granite in 1-2700th of a second. The speed with which the vibration, or impulse of compression is transmitted through a solid body, is far greater than the greatest velocity of any stamp. At the instant the stamp has come completely to rest, the compression it has made will have extended into the block to a depth ranging with the nature of the material.

Vibrations are transmitted through granite with a velocity of 1660 ft. per second. In the case presupposed, the stamp will have expended its whole force in 1-2700th part of a second, and the compression caused by it will have extended a little over seven inches in all directions from the stamp. The figure of this solid of compression (if it may be so termed), which has taken up the whole force of the stamp, will approach a hemisphere having a radius of seven inches.

Let us suppose that instead of raising a stamp of 400 lb. weight to a height of 15 inches, an equal amount of power is expended in raising a 100 lb. stamp to four times the height, or in raising it 15 inches, and then accelerating its fall with a pressure of 300 lb. of steam. In each case 500 ft. lb. are consumed, the final velocity of the lighter stamp being twice that of the heavier.

To compare the effects of bodies possessing the same mechanical movement but different velocities, let V denote the velocity with which the resistance R is encountered at the beginning of the time T. Let v denote the final velocity, G the weight of the body, and g the acceleration due to gravity. We have then from the laws of retarted motion the formula—

$$v = V - \frac{R}{G} gt$$

When the body is brought to rest, v becomes zero and the equation

$$V = \frac{R}{G} gt$$

t being the time required in coming to rest.

If a body of one-fourth the weight (1-4 G) having a double velocity (2 V), encounter an equal resistance, it will be brought to rest in a space of time represented by t'. By substituting these values and combining the new equation with the last we find $t' = \frac{1}{2}t$. The body of one-fourth weight, but double velocity, comes to rest in one-half the time, expending, of course, an equal mechanical power.

Applying these principles to the case in point, we see that, as the lighter stamp expends its whole force in 1-5400th part of a second, the compression caused by it can extend in that time but 3½ inches into the block. If the face of the stamp-shoe is very small, the bulk of rock over which the compression would extend itself, would be to that compressed by the heavier stamp, very nearly as one to four, or inversely as the cubes of the velocities. If the upper face of the block is not larger than that of the stamp, the whole compression will be transmitted directly downward, and the bulk of rock compressed will be inversely as the velocities.

By the more rapid blow the same amount of mechanical power has been concentrated on a smaller bulk of rock and the crushing effect is proportionally greater. Let us suppose the block of stone to be formed into a die with a face equal to that of the stamp-shoe and a depth 3½ inches. At the instant when the heavy free-falling stamp has come to rest, exerting its maximum of compression, one *half* of the force of the blow will have passed through the block into the foundation and be expended, in jarring it and the ground about it. If, as before said, the stone be just strong enough to resist the blow, the whole force of compression will pass off in useless vibrations.

If the lighter stamp with accelerated motion strike the same block, the compression produced by the blow will not have extended to the foundation, before the whole force of the stamp is expended. The stone will therefore be crushed to pieces.

Future economy in stamping is likely to be attained, not by increasing the weight of stamps, but the velocity of the blow. Practical objections to a high lift are numerous. Velocity can be much better attained by accelerating the fall, as the height of the lift may remain the same or even be diminished, and a greater number of blows struck per minute. The forging of hot iron so obviously demanded this, that the principle has long since been applied to the trip hammer.

In wet stamping, the rapidity with which a stamp is raised, influences greatly the amount of solid matter held in suspension. As the stamp rises, water flows from all sides to supply its place. The more rapid the rise of the stamp, the greater will be the velocity of the water, and the more surely will the finely crushed rock be whirled up into a state of suspension. If the blow is succeeded by another before the finer particles have settled, the stamp will act only on the coarser particles, packing less and sending more of the slime through the screen.

In some of the later forms of the stamp mill, while the principle of an accelerated blow is adopted, other novelties with which it has been combined, have been less well-conceived, and have done much to conceal its advantages.

The principle of high velocities finds its commonest illustration in the action of a bullet on a freely suspended object. If it be a block of wood, even although too thick for the ball to pass entirely through, almost the whole of the mechanical effect will be expended in crushing and dividing the fibres directly in its path, leaving little residue for producing oscillations. A heavier body with less velocity, would cause less crushing but greater oscillations. Stamps of high and low velocities of stroke have similar comparative effects in crushing the fragments of rock lying immediately under them, or jarring the mortar bed.

In blasting rock, quickness of explosion is equivalent to velocity of impact. The force of compression radiates in all directions from the drill hole. While the slower explosives take advantage of the weaker seams and have a splitting effect that runs to greater distances, the crushing and shattering effects of the explosion will vary directly as the volumes of gas generated, and inversely as the cubes of the times of explosion.—*From the forthcoming Report of the U. S. Commissioner of Mining Statistics.*

The American Institute of Mining Engineers.

BOSTON MEETING.

THIRD SESSION, WEDNESDAY AFTERNOON, FEB. 19, 1873.

Continued from page 227.

PROFESSOR R. H. RICHARDS, of Boston, read a paper on

THE MINING AND METALLURGICAL LABORATORIES OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

This paper is published in full elsewhere.

PROFESSOR BLAKE.—I have listened with great pleasure to the reading of this paper. I saw a part of the machinery described when it was set up in the Institute of Technology, and it gave me great pleasure, because I recognized in it a step in the right direction for the instruction of young men and scientific students who desire to apply directly the information they obtain in the laboratory, and to ascertain where they need the most light, and become familiar with those points in practical work which they require. Experience has shown this to be the case upon the western coast, where after a long and expensive trial of the laboratories of the chemist, the mill-men, the men who were accustomed to do things by main strength, became satisfied that they needed some help from outside, and finding they could not get it always satisfactory from the assayers and chemists who did not know what they wanted, and did not care as long as they got their fee for the assays and analyses, they went to work and put up in San Francisco assay laboratories upon a large scale. It grew first out of a demand, a commercial demand to ascertain the value, in silver or in copper, of ores shipped to San Francisco. Large quantities of ore were sent by miners from down the coast, from Lower California and Mexico to San Francisco to be assayed. The parties to whom these ores were sent wanted to know what they were worth; the parties to whom they proposed to sell them would not take the ores upon the ordinary assay of a fragment selected out of the mouth of the sack—would only take them after first getting the ores crushed and sampled in a proper manner to make the assays. The miners found out how this was done and they went to work and put up establishments of their own where loads of ore weighing perhaps a ton and even less, half a ton or five hundred pounds, could be crushed up into small fragments, shovelled together, over and over, and then when they got an honest admixture, they could send the sample to an assayer. After this experience, it was very natural that they should desire to know how such ores could be worked; and that led them to try them in the various pans and machines for grinding that have been manufactured. Inasmuch as the samples of ore were not large in quantity, they commenced making small trial pans—little working models sometimes would answer the purpose—into which they could put 10, 20 or 50 lbs. of ore and work a batch of it. The results were very satisfactory. They gave great satisfaction not only to the miners who had ores to sell, but to the mill-men and to the manufacturers of machinery, because the parties who were engaged in manufacturing machinery for the miners in the interior could, right in their own establishments, see the many difficulties which the mill-men had to encounter. They became aware of all the conditions connected with the erection and running of their mills and were enabled to provide for them. It has led to a succession of improvements, to the rejection of a great many worthless and useless machines, designed by parties who were not familiar at all with the working of ores, but who had patents on peculiar shaped or formed machines for crushing or grinding, and desired to sell those machines in the markets. Most of these worthless machines have been eliminated from the practice on the Pacific coast; and now I think I may say without danger that we make a better stamp-mill in the United States than is made in any part of the world, and we make better machinery for grinding and amalgamation, in pans, at any rate, than has ever been made before. It is very gratifying to any one who has seen the progress of improvement on the western coast, and knows how much has been done there by the experimental works of the mill-men and the miners, to see here in Boston an establishment complete in all its parts and capable of not only educating persons who are so fortunate as to receive instruction here, but also to do a great deal of good, probably, in making us aware of the value of the ores of this region, or any ores that come to this market, and of introducing a better knowledge of mining engineering to the manufacturers of this coast.

THE PRESIDENT.—Besides the function of instruction of students which requires that such apparatus should be of the received form, there is an important function which I think these practical laboratories will some day fulfil; and that is the carrying out of such experiments as will further improve the processes now in vogue. It is one thing to instruct our young men so that they can go west and handle the machinery now in use there. It is another thing, and an equally important one, to have machinery at our disposal somewhere where it can be run in a truly experimental manner, where truly scientific experiments can be made—by which I mean experiments so shielded from possible complexities and mistakes that the results shall be traceable to the proper causes. I may instance an investigation upon which I entered, some years ago, in relation to the efficiency of stamps, calculated with regard to their speed, weight and drop. Those three elements must have some definite relation to the efficiency of the stamp in the quantity it will crush. It does make some difference whether we

drop a heavy stamp a certain distance or a light stamp, weighing half as much, twice as far. I have been for some time a partisan of lighter stamps and more rapid blows than have been the fashion in many parts of the country, and in investigating that question and developing results, although I was able to eliminate from the problem such disturbing elements as depended upon the generation and transmission of power, I was not able to eliminate or perfectly estimate the influence of the facility and area of discharge, which has a decided effect on the quantity crushed, nor, on the other hand, the character of the rock; since in comparing different stamp-mills in different localities, you have always to bear in mind that you are comparing them by different standards. Some quartz may crush and does crush easier than others. We must throw out abnormal results on either hand. I have known seventy-two tons to be run in twenty-four hours through a ten-stamp-mill. The average would be something like twelve and a half to fifteen, and anything that varies far from that average in either direction might be fairly attributed to some abnormal quality in the rock. To make complete experiments of this kind you want to have all the conditions maintained except one. If you wish to test discharge, you want to use the same battery and the same quartz and vary nothing but the discharge; if you wish to test the speed and the weight of the stamp, you must vary nothing but the speed or the weight. That is impossible when you come to collect the results of experiments in ordinary practice. You cannot ask the mill-man to vary the weight or speed of his stamps, or to keep taking different kinds of rock and stop his running at short intervals and clean up with spasmodic frequency just to suit your desires. Hence it is almost impossible to get absolute results. I trust the creation of such laboratories as have been described to us in the paper just read will open the door to something like careful work of this character. A specimen of what I mean is furnished by the experimental investigation of the Washoe amalgamation, which was made under the charge of Prof. BRUSH, Mr. HAGUE and Mr. DAGGETT, on the ores of the Comstock lode, at the laboratory of the Sheffield Scientific School at New Haven. The results are published in the third volume of CLARENCE KING'S report. Another specimen of what I mean, I have been fortunate enough to secure myself through the assistance of Mr. G. F. DEETKEN, of Grass Valley, California, who has made a very thorough analysis at every stage of the California stamp-mill process.

I think it is a question worthy the consideration of the faculty of this school, whether some of the peculiar amalgamating machinery employed in California might not be with advantage substituted for the simple amalgamation in battery and on copper plates, which is recognized in practice now to be a wasteful method.

Professor ROCKWELL.—There is one point I want to call attention to in regard to the method of instruction—the practical course at Freiberg and some other schools abroad. As a prominent feature there, the student goes into the mines in the immediate vicinity and does the actual work. That practical course is aimed to be given to him to a certain extent here; though, of course, not in regard to working under ground. But there is one feature here that does not exist there. There he can only learn one process, one method of dressing one kind of ore and one method of smelting. Here it is possible to give him all the methods which he wishes to learn, not only in gold and silver, but all our processes for every kind of ore; the smelting processes of different kinds applied to the same ore, and also different ores treated in various processes.

Professor ORDWAY.—I hope the members will not expect too much when they visit our laboratory. We had to put up our apparatus in a building overcrowded, and, therefore, we have not been able to put in all the machinery that we wished. Again, we cannot build on the scale that we should wish, because we cannot afford to work upon many tons at once. We must work upon a few hundred or score of pounds, and it is difficult to make apparatus that will work properly on so small a quantity. A good many of these things are experimental at first. We shall have to rebuild them and work them over. None of them can be looked upon as perfect, or able to solve many of these problems for the miners outside. The apparatus has got to be primarily for instruction; but after we get it more fully developed, we hope to solve a good many of these problems, though it may be years before we can do much in that way.

President RUNKLE.—I think I ought to say a few words in justice to my colleagues and other gentlemen here. In the first place, as to the idea of the thing, but little credit should be attached to it. It is the execution of an idea that makes it valuable; and I ought to say, that when I visited San Francisco I was fortunate enough to meet Prof. BLAKE and have his valuable assistance in the selection of the apparatus for making a beginning here. Then, when I returned, I had the cordial and earnest co-operation of every gentleman connected with the Institute in any way; men who took hold of it with a will and believed the idea had value in it, and who were determined to execute it; and whatever we have done thus far is due to the energy and good judgment and zeal of my colleagues. I claim nothing whatever for it. I have been more than interested in the remarks you were kind enough to make as to the range of work which is possible in the future for us. Our only wish is to receive from all quarters advice and suggestions, in order that we may keep the metallurgical and mining laboratory in such a way that students can get valuable practical instruction and that even mining engineers who are settled in their profession, and yet feel that they have a particular problem which they wish to investigate with care, with all possible adjuncts and facilities, can come to our laboratory, or to some similar laboratory, (because there will be others) to do that work, in a way which they could not do otherwise, for various reasons. It would not be convenient for them to build up for the purposes of one experiment such a laboratory. What we want is that such a laboratory shall exist, that we may have the opportunity of judging apparatus, testing machinery, testing everything new and unsettled. Thus we would do our part in developing the great mining interests of this country and putting this industry on a sure foundation.

Mr. BOUVÉ exhibited several interesting and beautiful specimens of nitro-cyanide of titanium, realgar, and other furnace-products, from Scotland, England and Mexico.

Professor ORDWAY—I would like to correct an impression which seems to prevail, that there is nothing of metallurgical interest about Boston. A vein of iron has been discovered here, of considerable interest. It is undoubtedly one of Plutonic formation. It arose from the combustion in the fire of three thousand kegs of nails. It is magnetic; and as a relic of the great fire, it may be worth while to pass it round.

The PRESIDENT.—I should like to match that specimen with one in my cabinet which presents a most curious structure. It is a very pure metallic iron and yet it is beautifully laminated like the finest slate. It is the result of the effect of the Chicago fire on a quantity of "tin plate" from which the tin was removed by the extreme heat, and the iron afterwards welded together. I am told that there is no trace of tin left. You have a laminated mass of metallic iron produced by heat upon a box of tinned sheet-iron in the cellar of a hardware establishment in Chicago. We have often heard of the various processes for utilizing tin-scrap; and my friend who sent me this specimen, having lost a good many thousand dollars in Chicago, thought himself entitled to his little joke, and so sent word that he had a new process for getting pure metallic iron from tin-scrap—namely, to put it in a five story house with a wholesale liquor shop on one side and a varnish factory on the other and burn up the block!

Mr. RAYMOND then read a paper on

WATER IN WESTERN LIGNITES.

This will be published in full hereafter. The lateness of the hour not permitting discussion or further reading of papers at length, a paper by Mr. A. EILERS of New York,

CONTRIBUTIONS TO THE RECORDS OF LEAD-SMELTING IN BLAST-FURNACES

was read by title, and the Institute adjourned, to meet the next morning at the Institute of Technology.

On Wednesday evening the members attended the regular meeting of the Boston Society of Natural History, after which a delightful social reception was given them at the residence of Mr. BOUVÉ, the President of the Society.

FOURTH SESSION—THURSDAY MORNING, FEBRUARY 20, 1873.

The Institute met at an early hour at the Massachusetts Institute of Technology.

A paper was read by title, presented by Mr. J. W. HARDEN, of Philadelphia, on

THE WASTING OF COAL AT THE MINES.

This paper will be published in full next week.

A communication was presented from Mr. J. BLODGETT BRITTON of Philadelphia, concerning the appointment by the U. S. Centennial Commission, of a Commissioner to superintend the execution of a suitable plan for the systematic analysis of American iron ores and the presentation of results at the Centennial Exhibition. The subject was referred to the Council.

After the passage of a resolution of thanks to the public bodies and private citizens of Boston, for cordial reception and assistance, and to the Local Committee for its excellent arrangements, the Institute adjourned the last formal session of the Boston meeting. The rest of the day was spent in visiting the mining, metallurgical and other laboratories of the Massachusetts Institute of Technology, and the various scientific departments of Howard University (including a very pleasant reception and lunch at the residence of President ELIOT); and on the following day the members separated, most of them returning to their several homes, and a few visiting *en route* the Hoosac Tunnel, at North Adams, Mass.

American Society of Civil Engineers.

A regular meeting of this Society was held at the rooms in New York, February 19th, 1873.

The Secretary presented the following discussion of a paper "Upon the Character and Position of Neutral Axes as seen by Polarized Light," by LOUIS NICKERSON, C. E., of St. Louis, Mo., read before the Society, December 18th, last.

Col. MERRILL—This paper opens a field for examination which promises the most useful results, in a matter of vital interest to Engineers: the laws of strains in materials used in construction. The plan of using glass to find out these laws, brings to mind the practice of physicians, in ancient times, of determining the laws of the human body by experiments upon those of the lower animals. In examining the action of strains within opaque bodies, the method by analogy seems to be the sole one, aided of course, by what is visible on the surface and detected after fracture.

Further experiments will probably enable us to decide with fair accuracy, what is the magnitude of an unknown strain on a glass column, by comparison with the observed effects of a known strain upon a similar column.

The proposed strengthening of tubes by external rings at regular intervals is a curious result of the experiments, and, if confirmed by practice, a valuable discovery. The whole discussion illustrates the interdependence of all branches of physical science, and that no discovery is to be considered useless, no matter how far it is apparently removed from a practical application.

Mr. MCALPINE—The Civil Engineer has rarely to deal with glass as a material

of strength—still, evidently, it will be affected in the same way as any similar material, as cast-iron. It is a characteristic of this age, that every discovery in science is made useful to the engineer or contractor.

Some years ago, Prof. AIRY devised a system of measuring the strains in each member of a truss, with a model in steel, of which he had exact duplicates. When the model was loaded, a member was struck, and the strain upon it measured by the load borne by the duplicate when in accord. There we have *sound*, and here we have *light*, to aid in solving an important problem.

Gen. ELLIS—WERTHEIM, of Paris, invented an instrument for the determination of strains and pressures by the colors of polarized light. Mr. NICKERSON'S examinations are in the right direction, and it is hoped he will pursue the matter further.

What we want to know is—the elastic resistance to tension, and compression, in any one substance, and the effect of a weight upon a beam of the same substance; then, knowing by experiment, the elastic resistance in both directions of other substances, we might reason upon the position of the neutral axes of beams made therefrom.

Writers upon the strength of beams err in assuming that equal strains extend and compress the same substance equally, (thereby locating the neutral axis of horizontal strains in the middle of a rectangular beam;) also, that the elastic, and ultimate resistance are proportional.

How can polarized light show a neutral axis in a glass beam, supported at the ends, and weighted in the middle, instead of a neutral point under the weight; every where in the beam, except at the central point, there are diagonal strains, which will, as well as the horizontal strains, transmit the polarized rays.

The additional element of strength referred to in the paper is, I think, due to the elastic yielding of fibres which, in consequence, slip upon each other without a diminution of their ultimate strength; otherwise, in a beam under strain, the outer fibres would be ruptured before the others were loaded.

A communication from General SMITH, chairman of the committee appointed at the annual convention, held in Chicago, June 5th and 6th, last, to urge upon the United States Government the importance of a thorough and complete series of tests of American iron and steel, and the great value of formula to be deduced from such experiments, was read, stating that information is required of what has been done in this direction by other governments, as well as by corporations and individuals here and abroad—of new forms employed—and of new processes of iron and steel making, and their products.

A paper by Gen. W. SOOY SMITH, of Maywood, Ill., on "Pneumatic Foundations," was read.

The first two bridges on pneumatic pile foundations, erected in the United States, were, one over the Santee River, on the North Eastern Railroad, built in 1855—and the other over the Great Pedee River, on the Wilmington, Columbia and Augusta Railroad, built in 1857.

The air-lock used in sinking these piles was invented by ALEXANDER HOLSTROM; it was a cast iron cylinder 6 feet in diameter, and 4 feet high—closed at top and bottom by cast iron plates, through which were man-holes opening downward for entrance, and bull's-eyes of glass for light—two goose-neck pipes passed through the sides and bottom, one for the introduction of air and the other for the discharge of water, when it would not escape through the material underneath the pile. A windlass was attached for raising the earth within the pile, all of which was removed by hand. There were 4 air-pumps, set in a single frame, of such excellent construction that they served for the sinking of their foundations, those of the Third Avenue Bridge, New York, across Harlem River, and of the Leavenworth Bridge, across the Missouri River, on the Charleston and Savannah Railroad, and are now being repaired for use in sinking the piles for the Little Rock bridge, across the Arkansas River.

Construction of the pneumatic pile piers for a bridge over the Savannah River on the Charleston and Savannah Railroad, was begun in the fall of 1859. The air-lock used was 6 feet instead of 4 feet high, and, to save weight, the cylinders were of wrought instead of cast iron. Two defects were soon apparent, one, practically no light was admitted into the pile through the bull's-eyes in the air-lock plates—those in the bottom wing being covered with dirt most of the time; another—the air-lock was too small to stow the material raised, so that, when discharging the same, the work in the pile was much delayed.

To overcome these defects, an air-lock was made of less diameter than the pile, so that an annular space was left between the two, in the plate covering the top of the latter, into which bull's-eyes were introduced.

Through the side of the air-lock was a pipe or trap, inclined at an angle, to discharge readily any material put into it, and arranged for closing at either end—the outer end being closed, the trap was filled with material, the inner end was then closed, the compressed air thus cut off from the air-lock liberated, and the outer end opened, when the material would pass out. By reversing the process, the trap was made ready to receive material again.

By this modification, no artificial light was required during the day, and at night it could be reflected into the pile, without the inconvenience of candles or lamps burning in a compressed atmosphere.

No detention occurred from this or from voiding the material raised, and nearly thrice as much work was done in the same time as with the Holstrom air-lock.

It was soon found that the sandy material through which these piles were sunk, could be raised by the escaping compressed air through a discharge pipe, and delivered outside in a continuous stream; for this, the mouth of a flexible tube fitted to the lower end of a fixed pipe, was thrust into the wet sand, and moved from place to place as the material disappeared. The ratio of work done to that with the old air-lock, which before was as 28 to 10, now became as 28 to 1.

The improvements thus introduced have been generally used since, by Gen. SMITH, in sinking foundations by the pneumatic process. For the flexible tube, one iron pipe sliding into another, with hempen gasket between, has been substituted with still better results; thereby 7 men have excavated 6 cubic yards per hour, for several hours; by hand, two-thirds of a cubic yard per day per man is about the rate.

The late war interrupted this work, and also prevented consideration of a plan submitted to the United States Lighthouse Board in 1860, for the erection of a lighthouse on Frying-Pan shoals, or a similar position on the coast—embracing the sinking of a caisson, from 30 to 50 feet in diameter, to any required depth less than 100 feet, inside of which a masonry foundation of dovetailed stones was to be laid.

Soon after the war, the plan was adapted to the repairing of Waugoshance Lighthouse, located at the western entrance of the Straits of Mackinac, upon a rocky reef 2½ miles from shore. It is a brick tower 24 feet in diameter, 84 feet high from water surface to focal plane, and stands upon a foundation 24 feet square, consisting of a crib, filled with concrete and rubble masonry—this crib was surrounded by others filled with loose stones all framed together into one pier 100 feet square.

At this time the timbers, put it place in 1848, were decaying under the action of the seas, as heavy as any upon the northern lakes, and the ice, and the utter destruction of the pier was threatened.

It was proposed to protect the tower from waves and ice, by surrounding it with a strong sea-wall, 66 feet long, and 48 feet wide on the outside, 8 feet thick, and semi-circular at the ends. An annular pneumatic coffer dam of boiler iron was built up in place around the tower, large enough to enclose the wall. It was provided with two air-locks, each having a rectangular trap, through which material and workmen passed; and a windlass driven by steam. The dam was suspended by chains from beams resting upon the woodwork of the old pier, and, with stones, loaded somewhat in excess of its buoyancy. For 6 feet below the water surface, the crib timbers of pine, 12×12 inches, built up solid, and strongly drift-bolted with round 1 inch iron bolts, had to be cut through. The reef then reached was made up of boulders varying in size from a hen's egg to 10 tons weight; the large ones, when found under the edge of the caisson, were first split with plugs and feathers, or undermined, drawn into the caisson, and then split. In some instances where large stones rolled against the dam and kept it from sinking, the dam was allowed to raise, and the stones were rolled inward.

The dam was sunk to a depth of 12¼ feet below the water surface, and 6 feet below the foundation of the tower, which, though not upon bed rock, as expected when the work was begun, was, where the boulders, (which had lessened in size as the depth increased) were most perfectly compacted together, and below the scouring action of the waves, from which the dam was protected by the remaining portion of the cribs. The bottom of the dam was then sealed with two successive layers of the quickest setting Louisville cement, each 6 inches in depth, and set under water; which, when the air pressure was reduced, entered through holes left for it in the layers.

It was found the 12 inches of cement thus laid, would not, after 4 days setting, resist the pressure of water outside, hence the first three courses of masonry, each 2 feet thick, were laid in a compressed atmosphere. The stones were dowelled together with iron pins 2½ inches in diameter—the end of each pin was drilled 1 inch in diameter, 3 inches deep, and sawn, so that when in place, and a taper bolt was driven therein, the dowell was permanently enlarged.

When the wall was finished, the space between it and the tower was filled with concrete, and covered with flagging. The coffer dam, which might have been removed for use elsewhere, was left in place.

Work could only be done in the 6 months, beginning with May, and frequently it was interrupted by storms. During the first season, the chamber to receive the dam was excavated, the machinery was put in place, the dam built and sunk 4 feet. During the second season, the sinking was concluded, and 7 courses of masonry laid. And during the third season, the work was entirely finished. An average force of 40 men was employed. The entire cost, including a new dwelling for the lighthouse keeper, was less than $200,000. This is the first instance of the sinking of a pneumatic coffer dam or caisson in this country.

(TO BE CONTINUED.)

A Prize for Economy.

The Council of the British Society of Arts offers as prizes the Society's gold medal and £50 for each of the following objects:—1. For a new and improved system of grate suitable to existing chimneys as generally constructed, which shall, with the least amount of coal, answer best for warming and ventilating a room. 2. For a new and improved system of grate, suitable to existing chimneys as generally constructed, which shall, with the least amount of coal, best answer for cooking food, combined with warming and ventilating a room. 3. For the best new and improved system of apparatus which shall, by means of gas, most efficiently and economically warm and ventilate a room. 4. The best new and improved system of apparatus which shall, by means of gas, be best adapted for cooking, combined with warming and ventilating a room. 5. For any new and improved system or arrangement, not included in the foregoing, which shall efficiently and economically meet domestic requirements. The Council has been led to this step by the anxious discussions of the past five years upon the probable future of the British coal production, and by the stand taken by so many eminent engineers who have pointed out that much of the present great waste of fuel can be reduced by better appliances for burning.

THE COAL TRADE.

NEW YORK, April 18, 1873.

Business in the hard coal trade has continued rather dull. In spite of that fact, as if to show hesitating buyers the folly of waiting for a fall, prices will be advanced to-morrow by several companies. The Delaware and Hudson Company advance ten cents all round, the Pennsylvania Company will probably do the same and others are to make an advance on Saturday which, though not yet announced, will probably be about the same. Among the coals which will rule higher are those of the Reading Company the Great Mogul of the business now.

Mr. T. M. WILLIAMS, Inspector of coal mines, sends us the following list of casualties in the middle district of Luzerne and Carbon Counties.

Number of persons killed, forty (40), leaving 24 widows and 61 orphans.

Killed by fire damp explosions, 8; by falls of rocks 3; by falls of coal, 12; by falling down shaft, 3; by mine cars in various ways, 7; killed miscellaneously under ground, 4; killed miscellaneously above ground, 3; total, 40.

There were 121 non-fatal accidents, many of them are very serious and may in some instances yet prove fatal. Burnt by explosions of fire-damp, 24; by falls of rocks, 10; by falls of coal, 23; burnt by gunpowder, 3; by falling down shaft, 3; by mine cars in various ways, 24; miscellaneously under ground, 27; miscellaneously above ground, 7; total, 121.

Coal produced during 1871 was 3,000,000 tons—one death to each 56,000 tons, and one serious injury to each 32,000 tons of coal mined. Coal produced in 1872 was 3,250,000 tons—one death to each 81,250 tons and one serious injury to each 26,859 tons of coal mined (or rather sent to market.)

The total number of persons employed in 1871 were 9,870—death rate, .53 per cent. Do. 1872 were 9,807—death rate, .40 per cent. Decrease in 1872 was 63—decrease, .1 per cent.

In 1871 number of persons employed inside, 6,380, number of lives lost, 47—.73 per cent. Do. outside 3,490, number of lives lost, 6—.17 per cent. Total number of persons employed 9,870, total number of lives lost, 53—.53 per cent. Total number of miners employed, 2,270, included in the above aggregate.

In 1872 number of persons employed inside, 6,275, number of lives lost, 37—.59 per cent. Do. outside 3,532, number of lives lost, 3—.084 per cent. Total number of persons employed, 9,807, total number of lives lost, 40—.4 per cent. Total number of miners employed, 2,450, included in the above aggregate.

The above exhibits that there were sent to market 331.4 tons to each person employed in and around the mines, and 1,326 tons to each miner, for the year 1872.

Number of coal breakers in the district, 50, besides 4 that were abandoned during the year, and 7 that are being built. Surface openings as follows: shafts 34, including 2 abandoned, and 10 being sunk at present. Slopes, 37, including 2 abandoned and 5 new ones. Tunnels, 17, including 5 new ones. Drifts, 17, including 2 abandoned. Besides the above there are nine local openings—nine drifts and one slope. Total, 115 openings; 7 abandoned—108

Fans—twelve new fans have been put up during the year, and 3 now under construction, one 24 feet diameter, one 20 feet diameter, and one twelve feet diameter; otherwise ventilators remain about as last reported; but the ventilation has been improved in many places.

The Bituminous Trade.

Soft coal presents a more flattering aspect than its rival. Freights from Baltimore are $2 15, or ten cents lower, and business is very brisk. Gas coal shares in the general prosperity, and Virginia coal can now be sold at $8 25.

Bituminous Coal Trade, 1872 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending April 12, 1873, compared with week ending April 13, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	19,267	64,090	17,672	38,412
B. & O. R. R.	26,827	297,670	30,566	355,208
Penn. S. Line	....	.....	2,374	28,826
H. & B. T. R. R.	....	88 490	....	120,365
*Harrisburg & D.	9,576	157.784	7,434	101,678
*L. V. R. R.	502	10,791	1,096	9,641
P. & N.Y.C. & R. Co.	7,904	110,879	8,234	91,863
Cumberl'd Branch Canal	6,440	20,318	4,533	7,385
" Railroad	450	1,227	737	31,940
Total	70,966	746,249	72,652	785,318
			70.966	746,249
Increase			1,686	39,069

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending April 12, 1873, compared with the week ending April 13, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R. R†..	101,284	1,175,908	107,263	1,345,260
*Schuylkill Canal	26,275	59,970	14,329	35,001
*Lehigh Valley R. R.	65,186	1,023,177	55,227	997,760
Lehigh & Sus. R. R.	20,753	396,577	41,443	546,377
" " Canal	4,648	4,754	2,889	4,783
Scranton North	9,446	171,657	8,668	178.952
" South	46,122	576,864	50,504	577,813
Penn. Coal Co., rail	28,884	279,643	24,854	230,453
" " " canal	....	...	....	....
Del. & Hud. C. Co. Canal	10,666	10,666	4,000	4,000
" " East	14,724	176,340	9,250	104,666
" " West	1,163	104,283	1,618	115,043
" " South	7,642	96,542	3,727	95.592
Shamokin	10,675	119,475	8,075	133,092
Trevorton	....	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	11,485	185,256	9,524	198,584
Williamstown Co'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	358,953	4,384,112	341,471	4.667,376
1872	341,471			4,384,112
Increase				183,264
Decrease	17,482			

These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Company's use and Bituminous coal.

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending April 12—Compared with same time last year.

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct	TL WEEK tons cwt.	TL. DATE. tons.cwt.
Wyoming	20515 17	7037 16	2859 12	30113 03	451619 04
Upper Lehigh.		3473 01	329 15	3802 15	56.02 02
Beaver Meadow	1904 09	1213 03		3117 11	50788 02
Hazleton		87 11		87 11	4006 19
Mauch Chunk.	4208 10	5788 05		9994 15	112367 19
Total	26628 16	17597 15	2889 07	47115 18	674984 07
Prev'ly reported	323047 06	307947 00	1894 03	627868 09	
Total to date	349656 02	320544 15	4783 10	674984 07	
Same time .1872	272358 19	203502 03	4753 14	480614 16	
Increase	77297 03	117042 12	29 16	194369 11	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	26628 16	16794 16	349656 02	272358 19
Forwarded East by Rail to Local points	7991 12	2037 10	141905 17	89681 08
Forwarded East by Rail use Central Division	1953 19	724 11	28558 09	21679 09
Forwarded East by Rail use L. & S.		207 07	4020 04	2680 19
Delivered at and above Mauch Chunk	1105 11	1989 09	24202 16	15780 00
Delivered at Coalport & Hazard for Canal	4869 02	5950 01	29256 17	17716 07
Delivered to L. V. R. R. at Packerton	345 19	87 19	11621 08	4426 16
Delivered to L. V. R. Rd. at Sugar Notch			25553 06	
Delivered to L. & B. R. R. at Plymouth Bridge	4220 19	3237 18	63209 08	56290 18
Total	47115 18	30029 11	674984 07	480614 16

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending April 12, 1873.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	5,724	01	122,496	16
" Lack. & B. R. R.	295	00	10,690	03
" Pleasant Valley R. R.	3,505	02	53,732	19
" Sul. & Erie R. R.	.....		11,664	13
Total	9,524	03	198,584	11
Same time last year	11,485	09	188,255	14
Increase	1,961	06	10,328	17
Decrease				
Distributed:				
To Lehigh Valley R. R.	1,399	05	12,413	06
To Lack. & B. R. R.	35	16	386	00
To S. Central R. R.	.....		40,687	07
To Ithaca & A. R. R.	.....		31 695	13
To Erie R. W. Pockets for shipm't.	6,594	12	63,714	14
To individuals on line of road	203	01	15,024	03
To points at & above Coxton for use of Co.	600	13	10,479	16
To points between Waverley and Elmira	690	16	24,183	12
Total	9,524	03	198,584	11
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	8,203	09	91,270	10
Shipped south from Towanda	30	12	592	13
Northern Central R. R.	....		.....	
Total	8,234	01	91,863	03
Same time last year	7,904	00	110,879	01
Increase	230	01		
Decrease	.....		19,015	18
Distributed:				
To Erie Railway	6,965	07	76,209	11
To So. Central R. R.	1,238	02	14,908	13
To Ithaca Valley R. R.	....		117	09
Lehigh Valley, R. R.	30	12	340	01
To individuals on line of Railroad.	....		169	05
To points on line of road for use of Company	....		118	04
Total	8,234	01	91,863	03
Grand totals transported				
Anthracite	9,524	03	198,584	11
Bituminous	8,244	01	91,863	03
Total	17,758	04	290,447	14
Same time last year	19,389	09	299,134	15
Increase	.....			
Decrease	1,631	05	8,697	01

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, April 12th, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	22,450	19
" Port Carbon	4,836	09
" Pottsville	2,027	00
" Schuylkill Haven	23,960	17
" Pine Grove	6091	07
" Tamaqua	13,594	02
" Harrisburg	10	10
" Dauphin	4,512	02
Total	91,283	06

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	6,709	00
" Mill Creek "	1,163	12
" Schuylkill Valley Scales	746	10
" Mt. Carbon "	1,069	14
" Oressona "	6,586	19
" Pine Grove "	.....	
" Tamaqua "	961	16
Total	16,649	11

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	189	12
" N. C. R. R. passing Locust Gap	804	13
" " " Shamokin	3,156	16
" " " Herndon	.....	
Total	4,150	02

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,235	14
" Lebanon & Pine Grove Branch	701	13
Total	1,937	07

CONSUMED ON LATERALS.

From Frackville Scales	585	13
" Mill Creek "	949	02
" Schuylkill Valley Scales	249	06
" Mt. Carbon "	899	16
" Oressona "	341	15
" Pine Grove "	44	12
" Tamaqua "	774	08
Total	4,994	15

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	3,647	00
" " Catawissa R. R., Sent West	43	10
" " Rupert, Cat. & Wpt. Br.	.....	
" " Allentown, E. Penn'a Br.	44	16
" " Alburtis, "	.....	
" " Orelaud, G. & N. Br.	651	16
" " Willow Street R. R.	820	00
Total	5,207	02

BITUMINOUS.

From Harrisburg	7,304	04
" Connecting R. R., G. & N. Br.	.....	
" Junction R. R.	130	00
Total	7,434	04

COAL FOR COMPANY'S USE.

Anthracite	7,909	11
Bituminous	215	04
Total	8,124	15

RECAPITULATION.

	Total for Week.	Corres'p'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	91,283 06	88,572 03	i 2,711 03
For Shipment by Canal	16,649 11	29,740 03	d 13,090 12
Shipped Westward via Northern Central R. R.	4,150 02	5,670 14	d 1,520 12
Shipped West or South from Pine Grove	1,937 07	2,072 02	d 134 15
Consumed on Laterals	4 994 15	3,670 14	i 1,014 01
Lehigh and Wyoming Coal	5,207 02	1,297 15	i 3,909 07
Total Anthracite paying freig't	124,912 03	131,023 11	d 7,111 08
Bituminous	7,434 04	9,575 15	d 2,141 11
Total of all kinds paying freig't	131,346 07	140,599 06	d 9,252 19
Coal for Company's use	8,124 15	6 119 03	i 2,005 12
Total Tonnage for Week	139 471 02	146,718 09	d 7,247 07
Previously this year	1494456 07	1396777 10	i 97,678 17
Total to date	1633827 09	1543695 19	i 90,131 10

SHIPPED BY CANAL.

From Schuylkill Haven	14,150 15	25,037 00	d 10,886 05
" Port Clinton	177 00	2,125 00	d 1,948 00
Total Tonnage per Week	14,328 15	27,162 00	d 12,833 05
Previously this year	20,672 15	38,009 09	d 17,336 14
Total to date	35,001 10	65,171 09	d 30,169 19

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 12th, 1873.

	WEEK.	SEASON.
North	43,7 4 05	643,313 10
South	3,726 10	92,591 19
Total 1873	47,450 15	735,905 09
Corresponding time in 1872:		
North	45,385 11	683,623 14
South	7.642 10	96,542 19
Total	53,028 01	780,166 12
Increase North	.....	
Decrease North	.....	
Increase South	.....	
Decrease South	.....	
Increase	5,577 06	
Decrease	.....	44,261 04

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending April 12, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	10,718 02	231,468 03
" Hazleton	35,092 03	603,144 01
" Upper Lehigh	46 08	1,695 06
" Beaver Meadow	7,479 11	211,509 11
" Mahanoy	9,453 08	128,302 08
" Mauch Chunk	104 11	1,641 18
Total	62,896 03	1,177,860 07
Same time last year	78,372 19	1,186,393 19
Increase		
Decrease	15,476 16	8,533 12
Forwarded East from Mauch Chunk by rail	55,326 15	997,760 07
Same time last year	65,186 09	1,023,176 12
Increase		
Decrease	9,859 14	25,416 05
DISTRIBUTED AS FOLLOWS.		
Forwarded East from Mauch Chunk by rail	54,136 07	977,329 12
do East for use L. V. R. R.	1,190 08	20,430 15
Delivered at and above Mauch Chunk for use of L. V. R.R.	1,192 06	25,277 13
To P. & N. Y. R. R.	5,724 01	122,496 16
To N. C. R. R., at Mount Carmel		2,596 12
To D. H. & W. R. R.	367 17	14,370 05
To L. & S. R. R. at Packerton for rail	52 14	4,888 10
Delivered at M'h Chunk	17 00	1,405 10
Delivered on line of road above Mauch Chunk	215 10	6,331 14
To L. & S. R. R., at Penn Hav., for railroad		1,541 10
Do. for canal		
To Lehigh Canal Mauch Chunk		
To Catawissa Railroad		35 00
To L. & B. R.R. at Lack. Junc.		154 10
Total	62,896 03	1,177,860 07

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 12th, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	4,000	4,000
By Railroad, East	9,250	104,666
" West	1,618	115,043
" South	3,728	95,592
Total 1873	18,595	316,281
Corresponding time in 1872:		
By Delaware and Hudson Canal	10,666	10,666
By Railroad, East	14,724	176,340
" West	1,163	104,283
" South	7,642	96,549
Total	54,195	387,831
Decrease	71,550	

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday April 12, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt.	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1873	17,972 01	3,566 02	2,373 15	50,612 01
1872	19,237 07	26,827 06	....	46,094 13
Increase		3,738 16	2,373 15	4,517 08
Decrease	1,595 03	....	....	

YEAR.

1873	38,411 01	355,207 12	28,825 18	422,445 01
1872	64,090 11	297,610 04	....	361,760 15
Increase	....	57,537 08	28,825 18	60,684 06
Decrease	25,679 00	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co. Tons. Cwt.	Total. Tons. Cwt.
1873	4,539 05	736 19	5,276 04
1872	6,440 00	450 13	6,890 13
Increase	—	286 06	....
Decrease	1,900 15	....	1,614 09

YEAR.

1873	7,384 11	31,940 00	39,324 11
1872	20,318 06	1,226 10	21,544 16
Increase		30,713 10	17,779 15
Decrease	12,933 15		

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, April 12, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	8 668 00	178.952 07
Shipped South	50,504 01	577,812 18
Total	59,172 01	756,765 05
For the Corresponding time last Year:		
Shipped North	2,446 09	171,656 18
Shipped South	46,122 07	576, 64 05
Total	55,568 16	748,521 03
Increase	3,603 05	
Decrease	....	8,244 02

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending April 11, 1873.

	Tons. Cwt.
East	1.701 14
West	6,373 16
	8,075 10
Same time last year	10,675 10
Increase	
Decrease	2,600 00
Total amount shipped to date	133,091 19
Same time last year	119,475 08
Increase	13,616 11
Decrease	

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending April 13, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	24,854 02	230,453 09	28,884 04	279,642 12
" Canal	....	....	....	....
Total	....	....	....	....
Decrease 1873	49,189 03			

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. April 17. R. A.	W. A	AT PHILADELPHIA. April 17. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$5 25	— —	4 00
Steamer	— —	5 35	— —	4 00
Broken	5 60	5 35	4 25	4 00
Egg	5 75	5 50	4 40	4 15
Stove	5 95	5 65	4 90	4 30
Chestnut	5 10	5 85	3 75	3 50
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 50 cents.			— —	— —
Lump, (on board)	— —	5 25	— —	— —
Broken	— —	5 20	— —	— —
Egg	— —	5 20	— —	— —
Stove	— —	5 60	— —	— —
Chestnut	— —	4 25	— —	— —
Pea	— —	— —		
SPECIAL COALS.*				
Honey Brook, Le'h W. A.	4 60@5 50		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Room Run " "	4 60@5 50		— —	— —
Hill & Harris " "	4 60@5 50		— —	— —
Shamokin " "	4 60@5 50		— —	— —
Lykens Valley " "	4 75@6 00		— —	— —
Broad Top " "	6 50@— 00		5 25	— —

Company Coals.

April, 1873.

	L.	Str.	Gra.	Eg.	Sto.	Chest
*Scranton at E. Port	4 25	4 25	4 45	4 75	5 50	4 25
Pittston at Weehawken	4 70	4 70	4 70	4 90	5 40	4 60
*Lackawana at Weehawken	4 60	4 70	4 80	5 05	5 50	4 60
Wilk'b're at Hoboken	4 45	4 65	4 80	5 00	5 35	4 45
Old Co. Lehigh at Pt. John'n	5 50	—	5 30	5 30	5 45	4 60
Lehigh at Eliz. Port	5 00	—	4 75	4 75	5 10	4 15

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—April, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 75@6 00
Pittston and Plymouth, do	5 50@5 75
Shamokin Red or White Ash, do	5 50@5 75
*Lykens Valley Red Ash, do	....@5 80
By retail, all kinds per ton of 2,240 lbs	7 50@8 00
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	....@5 00
Fairmont and Clarksburg gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@12 00

* Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	....
Tyrconnel f. o. b.	$7 00

Prices at Georgetown, D.C., and Alexandria, Va.

April, 1873.

George's Creek and Cumberland f. o. b. for shipping	$4 60@4 75

Prices at Havre de Grace, Md.

April, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @....
Lykens Valley	@....
Shamokin Red or White Ash	....

Bituminous Coals (Cumberland).

Georgetown, F.o.b.	$4 60
Baltimore "	5 00
New York "	7 50
Samboy "	6 75

Prices of Foreign Coals.

April, 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Oaking	—@—
" Cannel	17 00@—
" House	22 00@23 00
" Orrel	19 00@—

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	23 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

April, 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack.
Block House	$2 50	$1 00
Gowrie	2 50	1 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal.
Pictou nett	$2 50	1 50
Sydney	2 50	1 00
Lingan	2 00	1 00
Caledonia	2 00	1 00

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton or 28 bushels.

AMERICAN.

	Nominal quo Currency.
Westmoreland f. o. b.	$6 50@7 00
Fairmount Gas Coal Co. of N. Y. "	6 50@7 00
Despard Coal Co. "	6 50@7 00
Penn "	6 50@7 00
Newburg Orrel Gas "	6 50@7 00
West Fairmount Gas Coal "	6 50@7 00
Redbank Cannel, Penn "	6 50@7 00

AT PHILADELPHIA.

Westmoreland "	6 50@7 00

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 20c., for use at Phil., $2 18 from Pt. Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	72
B. & D. R. R. } Cam. & Am. R. R. }	1
Shipping Expenses	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

Freights.—April, 1873.

Cumberland. TO EASTERN PORTS.	From Georgetown.	From Baltimore	Anthracite. From Philad'a.	From Elizabethport, Port Johnston, and Hoboken.	From Newburgh.	From Rondout...
Amesbury	—	4 00		2 20	—	—
Bangor	—	—		2 30	—	—
Bath	—	—		2 25	—	—
Boston	3 50	3 25		2 00	2 25	2 25
Bridgeport	2 90	2 50		1 40	1 60	1 25
Bristol	—	—		1 40	1 60	1 55
Connasset Nar'ows	—	—		—	—	—
Derby	—	—		1 25	—	—
Dighton	3 25	—		1 50	—	—
East Cambridge	—	—		2 00	—	—
Fall River	3 00	2 75		1 40	1 60	1 65
Hackensack	—	—		—	—	—
Hartford	3 00	3 00		1 50	1 70	1 75
Hoboken	2 25	—		45	60	65
Jersey City	2 25	—		45	60	65
Lynn	—	—		—	—	—
Middletown	—	—		1 30	1 50	1 60
Mystic	—	—		1 20	—	—
New Bedford	3 00	3 00		1 50	1 60	1 60
Newburyport	—	4 25		2 25	2 55	2 65
New Haven	2 90	2 50		1 00	1 20	1 25
New London	3 00	2 50		1 20	1 40	1 40
Newport	—	—		1 40	1 60	1 60
New York	2 35	2 00		45	60	65
Norwalk	—	—		1 00	1 20	1 25
Norwich	2 75	2 75		1 30	1 50	1 50
Pawtucket	3 00	3 00		1 50	1 70	1 70*
Portland	3 50	3 25		1 90	2 20	2 30
Portsmouth, N. H	3 75	3 25		2 15	2 50	2 60
Providence	3 00	2 75		1 40	1 60	1 65
Rockport	—	—		—	—	—
Saco	—	—		45	60	65
Sag Harbor	—	—		1 20	—	—
Salem	3 25	3 25		2 15	2 40	2 50
Stamford	—	—		1 00	1 20	1 25
Stonington	—	—		1 25	1 55	1 45
Taunton	—	—		1 90	—	—
Warren	—	—		1 40	—	—
TO RIVER PORTS						
Albany	—					
Catskill	—					
Cocksackie	—					
Coeyman's	—					
Cold Spring	—					
Fishkill	—					
Haverstraw	—					
Hudson	3 00					
New York vessels	2 00					
Nyack	—					
Poughkeepsie	—					
Rhinebeck	—					
Rondout	—					
Saugerties	—					
Sing Sing	—					
Stuyvesant	—					
Tarrytown	—					
Troy	—					
West Point	—					
Yonkers	—					

* And Towing.

St. Thomas	$— — Gold.
Martinique	— — "
Demerara	— — "
New Orleans	— — "
Mobile	— — "

Foreign and Provincial Freight

April, 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.	
Sydney	$3 50
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3
Little Glace Bay	3

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

MARKET REVIEW.

NEW YORK, April 17, 1873.

IRON—Cable advices for Scotch Pig continue to quote a weak market for the common brands, and prices here are in buyers' favor. Trade is mostly confined to wants of consumers, who, in anticipation of lower prices, and the tightness of the money market, have refrained from purchasing, except for actual requirements; sales have made of 300 tons Eglinton at $52; 150 do. Glengarnock, $53.50@54; and 200 do. Coltness, April shipment, on terms withheld. American Pig is quiet but firm at $50 for No. 1 Lehigh brands; prime Lehigh brands are difficult to be obtained in any large quantity; No. 2 is more plenty, but we believe there is none of any brand pressing on the market. New English Rails are without business; old may be quoted $55 for T., and $57@58 for D. Wrought sold on private terms; we quote from yard $52@53, and $55 for shipment. Refined Bar is in moderate demand from store, at former quotations.

LEAD—Pig has become very quiet, but prices remain firm at 6¼ cents gold for Ordinary Foreign. The sale of Domestic noted in our last was made at 6¼ cents gold, not 6¾, as misprinted. Bar 9¼ cents, Sheet and Pipe 10½.

COPPER—New Sheathing is steady at 43 cents, and Bolts and Braziers 45, Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts 32, net cash. The inquiry for Ingot is confined to small lots for immediate wants at 34 cents for Lake. In English, we note sales of about 50 tons B. S., part 30½ cents, 30 days. The movement is sluggish and the market is weak.

SPELTER—Has been very quiet, but stocks are held at previous figures, say 7¾@8 cents gold for Silesian, the latter price for special brands; 10 tons sold at 7¼ cents, gold.

STEEL—Importers of English have been forced at last to advance prices somewhat, amounting on best Cast to one cent per lb., and on Blister 2½ cents.

TIN—Pig is still neglected, and prices are entirely nominal at 38 cents for Banca, 33@33¼ for Straits, and 32½ for English, gold. Plates are also very quiet, but stocks are held firmly at our quoted rates. We have only to notice sales of about 1000 bxs. Charcoal Tin at $12,25 gold for I. C.

ZINC—We note a sale of 200 casks Mosselmann from agents' hands for forward delivery, at 10 cents, less 4 per cent. gold—lots from store, are selling at 9@9¼ cents net gold, and 10¾@11½ currency. Manganese black oxide 3½, do. gray 5½.

METALS.

NEW YORK, April 17, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ℔ ton	62 00@62 50
Gartsherrie	— —@— —
Glengarnock	53 00@54 00
Eglinton	52 00@— —
Pig, American, No. 1	50 00@— —
Pig, American, No. 2	46 00@48 00
Pig, American, Forge	40 00@42 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes (gold	137 50@142 50

	Store Prices, Cash.
Bar, Swedes, 1¼ to 5 x ⅜ & ⅜ 2 sq. & 6 to 12 x ⅜ & ½	150 00@160 00
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	107 50@— —
Bar, Refined, 1½ to 6 by ¼	— —@112 50
Bar, Refined, 2½ to 2⅞ round 1 & 1½ by ¼ & 5:16	115 00@— —
Large Rounds	115 00@127 50
Scroll	130 00@160 00
Ovals and half-round	132 50@152 50
Band	— —@125 00
Horse Shoe	— —@127 50
Rods, ⅜ to 3-16 inch	112 50@155 00
Hoop	155 00@180 00
Nailrod	@ 9½
Sheet, Russia, as to assortment (gold)	16 @ 17
Sheet, Singles, D. and T. Common	—6½@— 7½
Sheet, D. and T. Charcoal	—7½@— 8½
Sheet, Galv'd, list 5 per cent, discount	—@— —
Rails, English (gold), ℔ ton	70 00@ 71 00
Rails, American, at Works in Pennsylvania, currency	82 50@ 85 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	28 @— 30
Copper, Old, for chemical purposes, 14@16 oz	— @— —
Copper, American Ingot	33½@— —
Copper English Pig	— @— 30½
Yellow Metal, New Sheathing & Bronze	27 @— —
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1¼ cents ℔ lb. Pipe and Sheet, 2¼ cents ℔ lb.

Galena, ℔ 100 lbs	$— @— —
Spanish (gold)	6 62½@6 75
German, do.	— —@6 75
English do.	6 75 @7 12½
Bar (net)	9 25 @— —
Pipe (net)	— —@10 50
Sheet	— —@10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. (Store prices.

English Cast (2d and 1st quality) ℔ lb	— 18½@— 23
English Spring (2d and 1st quality)	— 9½@— 10¼
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d an 1st quality)	— 12½@— 14½
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— 11½@— 12
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	— @38
Straits	33 @33¼
English	32½@—

PLATES.

Fair to Good Brands.	*Gold.*	*Currency*
I. C. Charcoal, ℔ box	$12 25 @12 50	$14 50 @14 75
I. C. Coke	10 50 @11 00	12 50 @13 00
Coke Terne	9 00 @10 00	10 75 @11 87½
Charcoal Terne	10 75 @11 25	12 75 @13 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100lbs.

Plates, Foreign (gold) p. 100 lb.	7 75 @—7 87½
Plates, Domestic p. lb.	9 @—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb.

Sheet	per lb.—10¾@11¼

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, April 17, 1873.

The following report, from the San Francisco Stock Board, is dated the 15th inst. With the exception of an advance in Raymond & Ely of $3 per share, and a slight advance in Imperial, the market is weaker. From the above we infer that the mining suit of the Raymond & Ely *vs.* Herms, is progressing favorably for the former. During the month of January the Comstock (eight mines) yielded $1,212,919,82. This was from Belcher, Buckeye, Crown Point, Chollar, Hale & Norcross, Savage, Sierra Nevada and Kentuck. During the month of February seven mines (the list above given, less the Sierra Nevada) yielded $1,684,068.88—$441,149.55 more than in January.

	April 15.	
Savage	— 40½	—
Crown Point	— 92	—
Yellow Jacket	— 66	—
Kentuck, "New Issue"	— 7⅛	—
Chollar Potosi	— 39	—
Gould & Curry "New Issue"	— 7¼	—
Belcher "New Issue"	— 6⅝	—
Imperial	— 6⅞	—
Raymond & Ely	— 61⅛	—
Meadow Valley	— 12	—
Eureka G. V.	— 23	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

II. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

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April 1:6m

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1y-apr8-73

THE CALCASIEU SULPHUR AND MINING COMPANY of Louisiana, invites proposals for the construction of a shaft in Calcasieu Parish, State of Louisiana.

The object of said shaft is to reach a deposit of sulphur, about four hundred and forty (440) feet below the surface of the ground. The nature of the soil and thickness of strata are as follows:

First	160 feet of clay containing sand,
Second	170 feet of quicksand,
Third	210 feet of calcareous or limestone,

and next the sulphur bed, which is about one hundred and ten (110) feet thick.

The Company will exhibit a plan and specifications to contractors for said shaft, and has on the spot, iron rings, extraction engine and tools imported from Europe with the view of using the KIND & CHANDRON system, also a steam saw mill, abundance of timber, necessary buildings, &c., &c.

The work will be done under the supervision of the Engineer of the Company. Proposals will be received up to the 1st of July, 1873. Address

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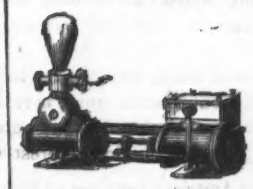

For sale at the Steam Pump Works, 34 to 44 First street, Williamsburg, N. Y. 1y

The Mining and Metallurgical Laboratories of the Massachusetts Institute of Technology.

By PROF. ROBERT H. RICHARDS.*

Of the several professions—the chemist, the civil engineer, the mining engineer, the mechanical engineer—the courses of instruction, as arranged at the scientific schools, differ considerably as to the amount of practical information which the student is able to gain. The analytical chemist has facility for a very thorough review of the processes which he will be called upon to perform. The student in civil engineering by his field practice learns the use of his tools and the art of taking field-notes. The mechanical engineering student is in the vicinity of machine-shops, which he can visit, and at which he can work. The student in mining engineering has no such advantages. The mines are at a distance, and the railroad fare to get to them is oftentimes an insuperable difficulty.

The aim of these laboratories is essentially to give to the student in mining and metallurgy a chance to study on a small scale the practical parts of his profession. We cannot, in a small laboratory, build a mine to timber, to work and to survey; we cannot make artificial quicksands and other impediments to mining. In short, we cannot study exploration; but we can study the mechanical preparation and the subsequent smelting of ores. Before presenting the plan of these laboratories it may be interesting to indicate the progress of the idea from its beginning.

During the summer of 1870 President RUNKLE visited the mines of Colorado, and while there, conceived the idea of making an expedition with the mining students to some of the western mining regions. He talked over the scheme with many railroad and mining men, and every where received encouragement. In the summer of 1871 the Institute party visited the mines of Colorado, and spent six weeks in taking notes of them. President RUNKLE here conceived the idea of building up a mining and metallurgical laboratory; and by the aid of BOOTH & Co. of San Francisco, a stamp mill was obtained, with the Washoe silver-working apparatus. During the year 1872 the metallurgical laboratory was brought to its present state of advancement by Prof. ORDWAY.

The two laboratories are intended to give students an opportunity to work, on a small scale, with all the mining and smelting apparatus which can be used to advantage in a laboratory. And this apparatus has been chosen, with the view to illustrate, as far as possible, the principles of all machines used in mining.

The mining laboratory now contains a fifteen horse-power engine; a BLAKE crusher; a stamp mill; a Washoe pan, settler and concentrator; a Rittinger automatic shaking table; a little hand-jigger; a rotary pulverizer; and a fan-blower. The metallurgical laboratory contains a blast furnace; a roasting and a smelting reverberatory furnace; a cupelling furnace; assay furnaces and a forge. The laboratory is equipped for easy blast furnace experiments, such as the smelting of copper and lead ores, for roasting operations on gold, silver, lead, copper, and antimony ores, and for the "Freiberg process" for silver.

A student receives an ore for examination, and in the presence of his instructor selects specimens containing all its characteristic minerals, which he determines, and then selects the method of treatment. Specimens are saved; the ore is crushed and sampled; assays are made, to determine its value. The ore undergoes the treatment which was chosen. Actual results are compared with the assay value of the ore, and, wherever practicable, the amount of fuel, power, labor and water consumed is noted.

But few experiments have as yet been tried, since the laboratories are scarcely yet completed. A gold ore from Acworth, Georgia, yielded the following results when treated by battery amalgamation:

Ore taken	176 lb.
Gold on plate	3.07 grains.
Gold panned from Battery	13.4 grains.
Rate of gold in the ore	$7.76 per ton.
" " " tailings	1.57 "
Percentage saved	83 per cent.

Apparatus for iron working is not yet represented in the laboratories, partly for lack of space, and partly because we have not yet decided what furnaces could be most usefully employed in a laboratory. A pair of crushing rolls is now in course of manufacture.

The mining schools of Prussia are owned and controlled by the Government, as is the case also with most of the mines and metallurgical establishments. In consequence, students have great facilities afforded them for acquiring practical information. In this country no such bond of union exists between the mines and the schools. The schools must here depend on the generosity and sympathy of the public, and, to obtain such help, they must in some way reciprocate it.

It is fully expected, that, by making students do systematic and careful work, results will be obtained, which will be of such value to the donors of the ores that they will feel more than repaid for sending them. If this expectation fails, the alternative always remains, that ores can be bought and shipped by the school.

The mutual interchange of ideas, between the instructors of the Institute and the miners, which will grow out of such work, is regarded as no mean part of the value of this laboratory to the school and to the public.

With regard to working ores for outside interest only, results being returned promptly, and a fee received in compensation for work done, I can only say that we have not force enough this school-year to make any promises whatever. I expect to be able to do prompt work in future years.

With reference to the students' work, the suggestion has been made that we should hold a tournament, as it were, for a month, keeping all mining students engaged at work in their regular shifts; that we should use all the apparatus during the month; have our regular break-downs, stoppages and patchings up, and settle up accounts at the end of the month, making such assays and analyses as are needed.

* A paper read before the American Institute of Mining Engineers, Boston, Feb. 19, 1873.

British Opinion of American Iron Production.

The sharp lessons of experience are compelling British editors to alter their old views upon subjects connected with British "supremacy" in mechanical industry. We pointed out a few weeks ago that the present embarrassments in English business circles would have been enormously increased had it not been for the restraining influence of the two and a half million tons of pig iron made last year in this country. The following extract from the *Colliery Guardian*, brings forward another of the disastrous results which would follow absolute dependance upon the mother country in the matter of iron production—a result which is no less than the dwarfing of our power as a nation.

The general conclusions which may be drawn from the data which we have been summarizing are—first, that American metallurgy has acquired during the last twenty years—and this in spite of the serious national troubles with which the Republic has been afflicted—a very great development; and secondly, that, vast as this development has been, it has been outstripped by the still more rapid progress of the American consumption of rails and other descriptions of iron. The vigor which has been displayed in the prosecution of new railroads in the United States during the last four years has been marvellous, and the existing systems have also been improved and extended as they have increased in productibility and importance, so that on all sides there has been a growing and extraordinary consumption of railway iron throughout Brother JONATHAN'S vast dominions. Those dominions are, indeed, so vast that one cannot at present discover a limit to the extent to which the work of American railroad construction may be carried, and the price of rails is practically the only consideration which has to be taken into account. If the Americans had only Great Britain to rely upon as regards their rail supplies, the construction of American railroads would probably have now to be, in a great measure, suspended; but American energy has been equal to the occasion, and we have now statistical evidence of the fact that two-thirds of the rails required for American railroads have been made of late in the United States themselves.

The present aspect of the iron question in the United States possesses much interest for the iron trade of Great Britain. So long as the Americans could obtain supplies of rails from this country at a reasonable price, they were content to import them with a certain freedom; but in exact proportion as British rails have risen in price, they have applied themselves with increased energy to the development of their own metallurgical industry. Never at any previous period of their history have the Americans devoted so much energy to the working of American coal and the production of American iron as in 1871 and 1872; and just as coal and iron have become dearer and dearer in Great Britain, so have the working of American coal and the production of American iron been still further stimulated. The result of this new order of things in the United States is reflected in a marked diminution in the American consumption of British railway iron. In the first two months of 1872 we sent the Americans 88,430 tons of our railway iron; in the corresponding period of this year, the corresponding exports sank to 48,901 tons, showing the alarming declension of 39,529 tons.

Import of Ores of the Clausthal, Freiberg and Mansfeld Smelting Works During 1872.

According to official data, the above German works bought and smelted during 1872, the following amounts of ore:

Harz Smelting Works	1,458,282.3	kilos,*	worth	*Th.* 812,935	*Sgr.* 2	*d* 6
Freiberg " "	1,311,760.1	"	"	1,071,646	" 1	8
Mansfeld " "	107,659.5	"	"	100,644	" 20	—
Total	2,877,701.9	"	"	1,985,225	" 24	2

which is equal to 6,344,182 lb. Engl., worth $1,429,362.58 coin.

During the first quarter of this year, the following quantities of ore have already been received, for which the annexed values have been paid:

Harz Smelting Works	609,579	kilos,	worth	*Th.* 454,071
Freiberg " "	644,350	"	"	408,907
Total	1,253,929	"	"	862,978

It is expected that the quantity of ore imported during 1873 will exceed four million kilos.

The greater part of the above ore is silver ore from Chili; next in importance is the supply from the United States.

* 1 Kilogramme = 2.2046 lbs. Engl.
1 Thaler = 72 cents coin.

A colliery manager in England lately testified in court that the average wages paid his men, including the hurriers, who receive 6s. 9d. per day, was 10s. 8d. a day, or $2 58. Thus it appears that the British coal miners are well paid—so well, in fact, that they are utterly careless of the time they work. Earning enough in half a week to keep them the whole seven days, they work only the half week. The manager above referred to said that fifteen of his men averaged only 10½ days out of 18 working days, and by this neglect his output of coal had been reduced, during February, 12 per cent. below the amount extracted last year. The judge fined the men 4s. per day, and costs.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

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The *Iron World and Manufacturer*, of April 15, contains a list of blast furnaces of the United States, which shows an amount of energy that will be appreciated by every one who has tried to collect statistics. Were the importance of even such simple facts as this properly understood the literature of American metallurgy would present an appearance very different from that it now has.

The Utah Central Railroad reports for March 52 tons of bullion imported, and the following exports: bullion, 300 tons; refined lead, 40 tons; ore, 930 tons. The scarcity of ore, and especially of coke, were severely felt during the month; but several works have recently started afresh, and the April exhibit will be far more favorable. The Germania refining works have also resumed operations, after having added materially to their facilities.

It may be imagined with what horror the editors of the ENGINEERING AND MINING JOURNAL discovered in the complete printed edition of last week's number, that the cut of battery mortars which adorned the first page was printed upside-down. An examination of the page-proofs corrected in this office shows that the illustration was rightly placed; and we owe it to the thoughtfulness and penetration of a zealous compositor that a marginal mark, referring to something in the text, was interpreted as a "turn-over" for the engraving. In contemplating the artistic result, the intelligent reader is requested to stand on his head.

In the concluding instalment of the report of the Boston meeting of the Institute of Mining Engineers, which we publish this week, will be found an interesting description and discussion of the mining and metallurgical laboratories of the Massachusetts Institute of Technology. This enterprising and flourishing school is making its mark as the nursery of intelligent and thorough practice in many branches of applied science. The cordial interest manifested by its faculty and students in the proceedings of the Institute of Mining Engineers was heartily reciprocated by the members when opportunity was given to examine the well appointed buildings and laboratories of the school. Under the earnest supervision of President RUNKLE, and with such live men as HUNT, ROCKWELL, ORDWAY, and RICHARDS in the departments more immediately connected with our profession, the Institute of Technology can scarcely fail of a great and a progressive success.

If the increased cost of coal in England at the mine's mouth is 12 shillings a ton, the total advance on 120,000,000 tons would be £72,000,000. How seriously this must effect the prosperity of the country for a short time, at least, may be judged from the fact that the accumulated profit of the British nation is, according to Mr. GLADSTONE, or rather was in 1870, £100,000,000. It is never possible to counteract at once such an advance of cost by raising the prices of goods, for in so marked an alteration of the ordinary conditions of business, many firms are forced to succumb which would have been able to continue if fair weather had prevailed. The history of England since the beginning of the rise would prove this, if it needed proof. Failures have taken place there in the face of a rising market and in the trades most benefitted by the advance. The more permanent effects of the advance must be looked for in the lessened power of England to compete with foreign countries. That we have spoken of before, and we now return to this subject to show how rapidly the cost of living and doing business has mounted the scale of yearly savings.

We publish this week a letter from Mr. OLD, in reply to our strictures on his Colorado pamphlet; and as the simplest means of avoiding a controversy on the subject, we make no rejoinder, except as to one point—namely, the distinction between igneous and plutonic rocks. The two terms are often used interchangeably, though, strictly speaking, the plutonic rocks are, according to LYELL and other geologists, those igneous rocks which are supposed to have cooled at a great depth below the surface, and are thus to be distinguished from the volcanic rocks, which are also igneous, but cooled on or near the surface. In spite of Mr. OLD's quotation, we do not think DANA or anybody else would call a sedimentary rock plutonic. As soon as the sedimentary character is established, the term plutonic is dropped, though it may have been employed while the origin of the rock was doubtful. Aside from this mere point of nomenclature, our views as to Mr. OLD's chapter remain unchanged, and we give him the benefit of his explanations without further comment.

WE are sorry to learn, from a somewhat satirical and sensational account in the Sunday *Mercury*, that the Texas Land and Copper Association is apparently suffering from paralysis. Under the auspices of this company a very interesting and commercially promising exploration was made last year, Prof. ROESSLER and Dr. LOEW having reported valuable discoveries of coal and metal in the district of Texas where the association has located its lands. But in other respects, the expedition is said to have been clumsily and wastefully managed, and to have terminated in the non-payment and consequent serious embarrassment or destitution of most of the employees. The blame is laid on the general managers, Messrs. J. C. G. KENNEDY, L. H. CHANDLER and W. C. MCCARTY; but the present apathy of the capitalists composing the association suggests an additional cause. This enterprise rejoiced in the possession of great names among its promoters. Mr. THOMAS SCOTT, JAY COOKE & Co., J. C. KENNEDY & Son, and six foreign ministers, are said to have been parties. Certainly there was capital and influence enough represented. But it is probable that most of these distinguished individuals merely subscribed small amounts, as "flyers," and did not back up the undertaking with a lively personal interest. Moral: a company of obscure people who mean business is a more reliable motive power than a company of eminent people who mean incidental speculation, and who write their small investments at once to "profit and loss," leaving them to take care of themselves. A small but steady stream will run a mill, but an occasional bucketful of water out of the Mississippi or the Atlantic will not even maintain a respectable puddle.

The Gold Yield of Nova Scotia.

Mr. A. HEATHERINGTON of Halifax, Nova Scotia, has published the statistics of the Nova Scotia gold mines for the eleven years from 1860 to 1872. These tables show that Nova Scotia, as a gold producing country does not take very high rank for quantity, though the yield of the ore is good. The chief source of gold is the quartz veins, placer digging being confined to beach washings. It is the opinion of some authorities that the auriferous sand and gravel of this province has been swept out into the ocean, while others take an opposite view, or at all events think that alluvial deposits may still be found. Of quartz, the amount raised in 11 years is 249,346 tons or less than 23,000 tons a year. When this is divided among the number of men at work we get some remarkable figures, such as an average daily return of 254 lbs. or, allowing one-third for absences and other disturbing causes, we have the labor of 6 men required to raise one ton of rock. Whether the millmen are included among these "miners" we do not know, but the out-put is remarkably small. The yield of this ore is 16 dwts. 20 grains per ton, while the average of 13 years in Australia is 10 dwts. 11 grains. The results of the 11 years work are quite instructive. The yield has been £839,484 and the expenses £760,000, leaving £79,484. Of this, the government took for royalties about £50,000, and left the investors £29,484 for their profit! To be sure the plant, tailings, etc., remain and are estimated at £75,000, but surely two-thirds of the profits is more than any government ought to exact. The English system of royalties has undoubtedly been serviceable in more ways than one, but it seems better fitted for the management of a strong district like Australia than of a weak one like Nova Scotia. Fifty-three mills have been built, and about a dozen are working. They average 10 stamps each and treat 72 tons a day, though their capacity is 530 tons. Mining is not in a flourishing condition, a misfortune due to the deepening of the mines, to narrow veins and to the old and wasteful methods of milling which are in use. Mr. HEATHERINGTON's tables are an instructive bit of official history.

The Tin Market and its Prospects.

Tin mining has presented some unusual fluctuations during the past season. There was a falling off of 2500 tons in the supply of Straits between November and March last, the reduction being attributed to "labor troubles" which seem to be a wide world disturber of trade. Fortunately for consumers the lack has been supplied by a large increase in the arrivals of Banca tin, there being 1300 tons more on hand in Holland at the beginning of March than the stock a year ago. Against this again is to be placed the reported falling off in the Cornish supply, for the correction of which we must look to Australia. It will be seen that the difficulty of estimating the chances of a new mine in the face of a competition controlled by a company with unknown powers of expansion, are very great. For the present, we will leave the question of prices with the remark that the standard of tin has been advanced £4 a ton in Wales. Prices are now: common, £6 15s., superior common, £6 16s.; fine, £6 17s.; superior fine, £6 18s. The Banca sale, for which 75,200 slabs are put up, is yet to come. This is 21,300 slabs more than was offered at the last spring sale, but the circumstances point to a probable advance.

The tin discoveries in Australia add to the difficulty of estimating the probable supply, for their value as producers is still an unknown quantity. We have already published accounts which, if true, would give Australia a high position among the countries which contest for the control of the tin trade. The latest accounts from that region say the discoveries are extending. *Iron* says:

"Within the space of a year, the whole of the northern country has been proved to be all, more or less, rich in deposits of this valuable metal, and now large discoveries have been made in the South, which lead to the supposition that the tin-bearing district extends for a considerable distance into the colony of Victoria. Advices have come to hand, that considerable deposits have been found on creeks which are tributaries of the river Murray, and upwards of 2,000 acres had been taken up; surveyors being employed in measuring and apportioning out other blocks which had been applied for. The sinking of these new fields had so far been found successful, but had of course been confined to prospecting; the prospects obtained, however, giving expectations of great results in the future, while the abundant supply of water, the great facilities offered for carriage, by the navigation of the Murray, and the comparative proximity of the terminus of the Victoria Murray River Railway, would be a great assistance towards the profitable working of the mines—considerable difficulty is, of course, experienced, and is likely to be so, for some time to come, in obtaining the services of experienced miners—as the fields which are already being worked in the northern districts have absorbed all the skilled labor available, and indeed would find plenty of room for a much larger supply of it than they can at present obtain. The news from the mines which are in full work is very satisfactory, as far as the quantity of ore obtainable is concerned. At Warwick, during one week, 114 tons of ore were received from Stanhope alone; during another week, 55 tons arrived from the same locality, and from the mines in the vicinity of Inverell one firm reports having sent nearly 53 tons to Sydney. In the Tamworth district, which has only lately been proved to be tin-producing, the enormous yield of 15 lb. of clean ore was obtained from a single prospecting dish full of dirt; another claim was washing out 30 cwt. per week; and at Vegetable Creek in that district, nine men were obtaining 1 ton of ore per day. Two hundred tons of ore had also been received in Sydney from the Decapolis. Sales of ore in large parcels had been made in Sydney at £1 2s. 6d. per cwt., which is a pretty good evidence of the richness of the samples. In the northern part of the colony, embracing nearly the whole of the New England district, the operations in mining had been very seriously impeded by heavy and unexpected floods, in the course of which the machinery and engine of the Elsmere Company, which had been erected at great trouble and expense, was carried away."

This is certainly pretty strong evidence of valuable deposits, and with the known energy of the modern prospector applied to the working of rich ores, there is no saying to what point production may be carried for a time at least. It certainly does not appear that there would be much chance in competition with two unknown, but certainly powerful rivals, for Mexican mines, hampered as their owners would necessarily be, by difficulties of transportation and the no less serious drawbacks incident to work among credulous and lawless people.

It remains for us to speak of Missouri. We do so not because there is any thing new there, but because a beautiful and ingenious theory has been invented in explanation of the fact, that none of the vaunted discoveries in that quarter of the world have ever come to anything.

"The tin trade," says one authority, "notwithstanding its immense volume, is a grand monopoly on account of its being entirely in the hands of importers and under the control of English capitalists. Tin mines have been discovered in various States, but to our certain knowledge none of them have ever been worked, and the reason is obvious. No sooner are mines discovered than the lands are bought up by parties interested in the importing trade, or by the representatives of English capitalists, who are engaged in the production or manufacture of tin and are looking to this country for a profitable market, and consequently the mines are allowed to remain undeveloped."

To these notes, which have already extended beyond our original intent, we will add a description of tin mining in Banca, published by the *Mining and Scientific Press* of San Francisco, some time ago.

"Tin appears only either as a sulphide or as a binoxide (Cassiterite). Tin as a sulphide is very rare, but as a binoxide it occurs quite frequently, and is found in Chili, Mexico, Brazil, England, Bohemia, Saxony, Spain, Burmah, Malacca, and California, but especially in Banca and Billiton. It appears in Banca as stream tin (black, and sometimes light brown) and as vein tin. At present the Dutch Government only work the stream tin in Banca, which is deposited in the valleys in enormous quantities. The beds are from nine feet to thirty feet deep, and consist of mud, red clay, blue clay, coarse and fine gravel, and tin. The tin beds are generally from three inches to twenty-two inches deep, but in some localities still deeper. Kaolin (porcelain earth) appears below the fine gravel, and there is no hope of finding tin below that. To examine the mineral capacity of the valleys, cuts are run across them at about 100 yards apart; three inch holes are bored in these cuts from twenty to twenty-five yards apart; a copper pipe is let in to prevent the sides of the holes from falling in, and an exact quantity of tin ore taken from each hole. The tin extracted from all these different holes is carefully washed and weighed, and a calculation is made as to the probable richness of the valley. Mines are then laid out to be worked during the hot season, which continues eight months. The remaining four months of the year, which form the rainy season, are occupied in smelting."

"All of the mines are worked under the superintendence of European mining engineers and foremen, with companies of from sixty to 300 men. Work on these surface mines is begun from the lower end of the valley. Before commencing operations a dam is made across the valley, and the water drained off by means of ditches, which are used in the process of washing. The water from the mines is removed by means of chain pumps. The gravel from the new mines is disposed of by being thrown back into the old holes.

"The treatment of the tin (Cassiterite) is very simple. After being washed out, the mineral is taken to be roasted in a reverberatory furnace, for the purpose of getting rid of the arsenic and separating the sulphides of iron and copper. The roasted masses are then placed in large tubs of water, where the sulphides of iron and copper dissolve, and the oxides of tin, iron, and copper settle down. The separation of the sulphate is performed by evaporation and crystallization. The oxides are exposed for several days to the air, and afterwards worked. Then the oxides are mixed up with charcoal and put in a blast furnace. This is a vertical cylinder of cast iron, 9ft. high, covered with clay. The liquid tin runs with the slag into a trough outside the furnace. From time to time the floating slags are taken off, and when the trough is full the vent is opened, and the metal runs in a second trough. In this trough the remaining foreign substances are taken off. This is done by dipping pieces of wet greenwood in the melted mass. The charring of this green wood produces steam, and causes the foreign substances to float, so that they are readily taken off. By this method the tin produced in Banca is the best in market. It is soft, pliable, easily stretched, very clear, and of a shining bluish-white color, and easily smelted.

"The Government supplies the Chinese only with the mining engineer, foreman and furnaces. They have to supply themselves with everything else—tools, chain pumps, &c. They receive from the Government 5·09 dols. for each 100 lb. of cast tin, so they are enabled to make considerable money when industrious. The clear profit to the Government, while I was in Banca, amounted to about 5,000,000 dols. per annum. The veins of tin are very rich and extensive. The principal ones are in the hills of Merawang, Bockit, Palawang, Soengie, and Paceo."

Super-heated Steam Detector.

Our readers will recollect the discussion which recently raged, concerning the possible origin of conflagrations from the superheating of steam in pipes used for warming. We published at the time an article by Mr. H. F. WORTHINGTON, which gave what was, in our judgment, a complete and trustworthy survey of the question. In that paper, Mr. WORTHINGTON sums up the requirements of safety in steam-heating apparatus (so far as super-heating is concerned), as follows: "Never allow the fire or the hot products of combustion to come into direct contact with the steam after its generation. Use boilers of well-known and improved plans, of ample size, with large steam and water spaces, avoiding concentrated, contracted and complicated forms."

It is not denied that superheated steam, if formed and carried through the pipes, might heat the latter to a dangerous extent; but it is claimed that with boilers of proper construction, under reasonable pressure, and well supplied with water, this will not occur. The fact remains, however, that many boilers in use are not so constructed as to secure safety in those respects, and that the supply of water is usually, in city houses, dependent on the mains and pipes of waterworks, and regarded as a matter of course by the servants. A failure in the supply, or an obstruction of the pipes by freezing or other cause, may bring about low water in the boiler, and so the generation of superheated steam.

In view of these facts, to some of which we have made allusion in former articles, Messrs. JOSEPH NASON & CO., of this city, leading manufacturers of house-warming apparatus, have introduced a novel, simple and effective device, which can be attached to any boiler, and which will prevent the entrance of superheated steam into the warming apparatus, or, if the evil cannot be thus prevented, will give an alarm. This contrivance consists of a small auxiliary tank, through which the steam-pipe from the boiler passes in a coil. This tank is nearly filled with water, over which is a small steam-space, and a safety-valve. The steam passing through the coil soon heats the water to its own temperature; and the steam-space in the tank becomes filled with steam corresponding to that temperature. If, from any cause, the steam in the coil is superheated, the water around the coil takes up the surplus heat at first, without condensing the steam; but this surplus heat causes the formation of additional steam in the tank, and this new steam, being always in the presence of water, is not superheated, but saturated. Its increased temperature is therefore accompanied by increased pressure; and if this process is continued beyond a certain point, the tank safety-valve opens and gives the alarm. For this purpose, the safety-valve of the tank is somewhat more heavily loaded than that of the boiler.

This arrangement is a beautiful application of the distinction between saturated and superheated steam. The peril to be guarded against lies in the fact, as Mr. WORTHINGTON states it, "that steam, when heated apart from water, can, like

atmospheric air, be brought up to a high and dangerous temperature without a remarkable or, perhaps, noticeable change of pressure." The alarm must be given, then, either directly or indirectly by means of the temperature. Directly, this might be done by the use of cocks of easily fusible alloy. Indirectly, but more efficiently, economically and permanently, it is accomplished by the simple expedient of transferring the heat of the *superheated* or *gaseous* steam to a body of circumjacent water and *saturated* steam. The abstraction of the heat is, in the first place, a partial remedy; and in the second place, if this remedy is not effectual, then that which the superheated steam would not do, the saturated steam heated by it will do—namely, exert a pressure corresponding with its temperature, open a safety valve, and blow an alarm. We understand that Messrs. NASON will manufacture and sell this useful attachment, independent of any particular kind of boiler or heating apparatus, since it can be conveniently combined with all varieties of these.

CORRESPONDENCE.

GEORGETOWN, Colorado, March 26, 1873.

EDITOR ENGINEERING AND MINING JOURNAL:

Dear Sir—I have just noticed, in your last issue, a criticism on my late pamphlet—"COLORADO: ITS MINERAL AND OTHER RESOURCES," which I feel myself somewhat called upon to answer, and ask that you kindly accord me space in your columns for the following:

Thanking you for the recognition of considerable merit, which you conceive my work to possess, I proceed to quote from your remarks; and first—

You say: "There is a noteworthy absence of such records of actual cost of working, etc., as would permit exact estimates of profits"—to which I answer: That while acknowledging the benefit to be derived from a statement of the working expense in the instance of as many of the individual mines noticed as possible, I found, after mature consideration, that to give such "actual cost" would be to return the expense of mining in Colorado at from *two* to *three* times what the average of such should be, were proper mining studied and carried out. Consequently, as there would be but few persons into whose hands my pamphlet would come, who would care, or perhaps could distinguish in a mere statement, between what really was economy and what was waste in expenditure, and who, in the case of the latter, where a profit failed to be shown, would be more apt than otherwise to blame the mine—accusing it of poverty—than suppose the management to have been at fault, and hence unintentionally injure and unjustly retard investments in Colorado mines and mining, I concluded (with an exception here and there,) to say nothing. With, then, the simple facts of quantity and quality presented to them, coupled with the amount of development shown, and the really great waste of value in *all* of the gold and considerable of the silver ores of the Territory, as apparent from the large number of assays given, and the returns of mill runs and other methods of treatment, I took it for granted, more correct conclusions would be reached by those whose interest in the facts and statements given them would be sufficient to lead such to compare quantity and yield with other countries; and, after making all due allowances for increased cost of material here, the enhanced rate of wages, and, perhaps, for more frequent contingencies, arrive at a pretty close, or at least at a fair, estimate of what should be probable profits and loss. Besides, it is an admitted fact that the most of even our *best* mining in this Territory is but poor, and that economy even under circumstances ordinarily favorable, instead of being the rule, is fearfully the exception.

In regard to the *last* of the requirements not being as you say "very severe," I acknowledge it might perhaps as well have been omitted; but as it is, in its *simple* statement, correct, it can do no harm for it to remain where I have given it a place.

With reference to the word *plutonic*, and your objection to my use of it, I would say, that the *sense* in which I use the word, and the meaning I attach to it, is *precisely* that of DANA, where in his *Manual of Geology*, (pages 74 and 75,) speaking of the metamorphic or crystalline rocks, and of their being *sedimentary*, he says: "Granite stands at one end of the series, and hard sandstone, called quartzite, hard slates like roofing slates, and partially crystallized limestones, at the other; so that a distinct line between them and the sedimentary beds cannot always be drawn. They are sometimes called *plutonic* rocks to distinguish them from the true igneous rocks." But should it be denied that DANA means or includes the class of rocks with which Colorado abounds, and which you say are not *plutonic*, I will refer you again to page 75, where, distinguishing still the one class from the other, he defines those rocks he characterizes as *plutonic*, to be composed of two or more of the following ingredients, viz., *quartz, feldspar* of different kinds, *mica, hornblende, pyroxene, talc, epidote, chlorite*, and *serpentine*." Now, as the authority I have quoted is standard, the error I conceive you to have made in supposing me, as you have, to be wrong, comes of the fact that you confounded *igneous* with *plutonic*, and drew no line of distinction between the two classes of rocks these terms denote.

What next follows in your criticism has been, I consider, mainly answered above, particularly when I have never supposed other than that, as you say, "there is scarcely a formation that has not somewhere been found productive in useful minerals, from the latest alluvium back to the oldest gneiss," excepting that, while thus found, the deposits have often proved only temporarily productive, although, for the time being, sometimes more than ordinarily rich and profitable.

The fact admitted in reference to the vein structure of the great Comstock lode, is for me, and *my* "first pre-requisite to successful mining," a corroboration, however "severe," or the reverse, I may be thought to be.

Your next criticism is but a play upon the word "*unquestioned*," meaning, in the sense I intended, *undoubted*. Prospecting, exploration, and mining, are relative terms. Prospecting is pursued, that a discovery be made; exploration, that some evidence of value be shown; and mining, that money, profit, be the result. Without a discovery, or a show of something that promises, (and the more there is promised—*i. e.* that shows to be "unquestioned"—the better) what would there be to explore, and where would there be any assurance that successful mining could be prosecuted? In prospecting, exploring, and mining, I would always aim for the *best* evidences, not one, but two, three, or a half dozen, if possible; and the less questionable, the more "unquestioned" and reliable. *I hope I am understood.*

In reference to my asserting the necessity of an "outcrop," etc. etc., and my remarks in the fourth, fifth and sixth sections of my chapter on "LEGITIMATE MINING," which you more or less (and not very generously) criticise, I say, I do not stipulate, or mean to stipulate, that *all* the evidences cited are necessary to be possessed by *any one* lode, before successful mining can be expected to be carried on, but that the more of such evidences can be adduced in favor of any lode about to be explored, or if explored, mined, the better. So generally is this fact acknowledged, that the great aim among explorers and miners has been to convince themselves and others, that their particular mine possesses these *pre-requisites*; and to show that you believe in them, I need only state, that if a mine (offered for sale as such,) did not possess at least several of these evidences, you would not want it, and would be very far from advising its purchase by anyone. To follow, then, the instruction I give (retaining in its place in my pamphlet the *objectionable* chapter, at the same time accepting, *as an addition*, what you insist should replace it,) will ruin no company formed for mining, but, contrariwise, insure success—the statement you make against it notwithstanding.

My knowing better, as you say, than I write, is a compliment; and I accept it as such, for did authors not know more than they write, they would be poor indeed, it not being supposed that any one ever gave to the world *all* he knew.

As to my pamphlet "assisting the sale of undeveloped mining properties at large sums of money in England," I beg to refer you to my chapter on "SPECULATIVE MINING," which, by some strange freak, you seem to have overlooked entirely, where I not only say that mines, "although ordinarily rich, have been unable to return a profit upon invested capital," "when half or a third of their usually too large amounts should have sufficed and been ample," but I deprecate (throughout the whole article,) and in the strongest language possible, the spirit of excitement that generally prevails in mining circles leading to "manias and panics." Particularly do I deprecate the too often manifest lack of careful judgment in first selecting mining properties to work, and after the purchase of such interests has been effected, the woeful lack also of economy and honesty in the disbursement of funds—"*company* funds" generally suffering more in this particular than private means. In view then, as I conceive, of the value of the suggestions and statements made in the above chapter, I respectfully ask for the same a careful perusal—both from you, that justice may be done to me, and from those of your readers who may have read your criticism, that the biased impression they may have received as to the merits of my pamphlet, be changed.

The warning with which you close your article, the graceful compliment you pay me, the lesson you would teach all sinning against the *best* interest of Colorado, etc. etc,, is good, and with me measurably redeems all you have said against

Yours very truly,

R. O. OLD.

MINING SUMMARY.

Colorado.

From the March number of the Georgetown *Mining Review*.

(CONTINUED FROM PAGE 236.)

JOHN SCUDDER is working on the Central G. M. Co's property, east of the University claim. He is raising about two cords a week of from eight to ten ounce ore.

Quite a number of mines around Nevada are being worked by lessees. Only three mills are running, on account of the scarcity of water, these are POTTER'S, twenty stamps, WHITCOMB'S, twenty stamps, and CLAYTON'S, twenty-five stamps.

The Shanstrom Bro's are working on the American Flag. They employ thirteen men and raise about a cord of ore per day. HARRIS & Co., also have a lease on the Flag, and another party whose name we do not know, are working between Shanstrom and Harris.

Messrs. HANCOCK and Co., are working the Harper claim on the California lode. They have a fine body of ore some of which is very rich in copper.

MITCHELL and DEXTER are working the Alps.

Several claims are being worked on the Mercer County, Kent County, Burroughs, and Kansas.

One claim on the Prize is being worked, and one on the Jones lode. JORDEN and SALISBURY are working the Senderberg.

Work is being revived in Russell Gulch and vicinity. Mr. PERRIN is working a new discovery which promises well.

The Wartoga, Minnesota, and Missouri are all being worked, and the Pewabic tunnel is being driven on. It is about 700 feet long at present and one lode has been crossed by it which looks well.

In the Leavenworth Gulch the Wood, Harsh, Columbus, and Leavenworth lodes are worked.

Nearly all the Mills in Black Hawk are receiving good supplies of ore, and are

pounding away quite merrily in spite of hard times. The general feeling is, and the facts seem to warrant the belief, that the worst is over, and that business of all kinds will revive, and that the bullion shipments will soon reach the highest figures of the past. The shipment for February is estimated at $150,000, though we think this a little high.

The Wood lode is turning out large quantities of Pitchblende. One piece of ore, weighing over 200 pounds and containing about fifty per cent. of that mineral, was raised a few days ago. The seam has been at times eight inches thick.

Nevada.

From the Gold Hill *News* of April 5th:

SAVAGE.

The main drift south on the 1600-foot level is still driven ahead, the rock in the face working well and good progress being made. The drift northward on the ore body discovered last week in the first west cross-cut, 150 feet south of the incline, has been pressed steadily ahead during the week through low grade ore, the development so far not proving as valuable as the first indications promised. The other cross-cuts on that level have developed nothing of material interest since our last report. The main drift north on the 1600-foot level, to connect with the south drift from the Gould & Curry, is still pushed steadily ahead, with no disclosures of interest to relate. The main drift on the 1700-foot level is advancing at the rate of five feet per day, the ground in the face working splendidly and excellent progress being made.

CHOLLAR-POTOSI.

Daily yield, 160 tons of ore, the assay value of which is $40 per ton. The ore breasts in the different ore-producing sections of the mine are looking and yielding finely. The main northwest prospecting drift at the fourth station—850-foot level—is still pressed ahead with all the vigor possible, the rock in the face slacking, swelling and closing in from all sides at a most fearful rate, crushing the heaviest timbers it is possible to use in a single day's time, and on one occasion closing up the drift in a few minutes until the workmen could not get the car out without first repairing the tunnel. The continual repairing necessary greatly impedes the progress of the drift, but as there is no way of avoiding it, the repairing must continue until the ground ceases to swell. All work in the prospecting drift at the fifth station is suspended for the present.

HALE & NORCROSS.

Daily yield 170 tons of ore. The ore breasts at the second station are both looking well and yielding largely. The ore breasts at the ninth and tenth stations are about up to the usual average yield for the week. The main north and south drifts at the twelfth station (1700-foot level) are still driven ahead, with no change of interest for the week. The ore body in the raise on the west vein adjoining the incline is still opening out and yielding finely. The cross-cuts both east and west on this level have developed nothing of importance as yet. The ore body in the north engine winze is opening out finely, gradually widening to the northward, developing ore of a fair grade. To the southward it is narrowing down, but the quality of the ore continues good.

GOULD & CURRY.

The north drift from the main east drift on the 1500-foot level is making good headway, following the vein of quartz to the northward, which is somewhat improved in appearance, but has not as yet shown any valuable ore developments. The main south drift on the 1600-foot level, to connect with the north drift from the Savage, is pushed steadily ahead, without change of interest to chronicle. The work of putting the new pumps in the shaft ready for extracting the water, is progressing with all the speed possible.

WOODVILLE.

There being no trouble from epizoetic, lack of wood or anything else, operations are going forward in this mine more vigorously than ever. A large amount of first-class ore is developed in the mine, and the dumps are also filling up. Two mills will be started up on this ore by the 15th of this month, and possibly a third, when the bullion yield is sure to be large. There is plenty of ore in sight to run on for eight months or more, during which time considerable more will be developed.

BALTIMORE CONSOLIDATED.

The pump at the second station is in complete running order, and will be started up to-morrow morning. Work in the face of the main west drift, to cut the ledge, at the first station, will be resumed on Monday next, when some good developments may be looked for; the body of water which drove the men out, and stopped the work at that station some weeks since, undoubtedly came from the ledge.

NEW YORK CONSOLIDATED.

Sinking the shaft is progressing downward at the rate of a foot per day, the rock in the bottom blasting hard and the flow of water still considerably impeding the progress of the work. The quartz struck in the bottom of the shaft last week proves to be only a large spur from the main ledge, but shows some very favorable indications.

SIERRA NEVADA.

The prospecting work in the new shaft is suspended for the present. The ore breasts in the upper portions of the mine are extending to the north and west and yielding finely. The daily yield is 60 to 65 tons of good milling ore. The mill is in good running condition, and is crushing an average of about 60 tons of ore per day.

EMPIRE.

This mine is improving in almost every part. The ore bodies found on the 1600-foot level are widening out and steadily improving in richness, while that in the winze in the south Empire, from the 1600 to the 1700, is daily showing better, and promises rich and valuable developments for the future.

KNICKERBOCKER.

The water has been drained from the shaft until the pump now handles it with ease. The main west drift at the first station has cut the ledge, developing a considerable body of low grade ore which is slightly improving in quality as the work advances, occasionally giving excellent assays.

ARIZONA AND UTAH.

Sinking the shaft is making good progress notwithstanding the rock in the bottom continues to work tough and blast badly. The pumps continue to handle the water with perfect ease, which is showing signs of a steady decrease.

YELLOW JACKET.

The water being drained out of the 1500-foot level, drifting east will be resumed to-morrow. The north drift at the 1400, and the cross-cutting at the 1300-foot level, is progressing as usual, with no new developments to report yet.

KENTUCK.

Cross-cutting and prospecting the ledge at the 1300-foot level, still continues with no important developments to report.

SENATOR.

Still hoisting water and getting ready to continue sinking the shaft.

BELCHER.

Daily yield 440 tons. The piston rod of the air compressor of the hoisting engine at the 1200-foot level broke yesterday. It will be repaired, however, in 48 hours. Eighty tons per day are taken from the 1300-foot level, through the Yellow Jacket shaft. In a couple of days more, however, when repairs to the boilers are completed, about 180 tons will be taken out that way and the yield of the Belcher increased to 500 tons or more per day. This level is opening out splendidly and bids fair to prove the best in the mine. The main drift south and the cross-cut east from it are discontinued at present until the winze shall be completed between this and the level above, giving needed ventilation. All the other ore breasts and levels are looking and yielding finely. The incline is down 100 feet below the 1200-foot level, in hard-blasting ground. The drift north from the incline at the 1200-foot level is in 200 feet, and the drift south to meet it, 332 feet. They will connect in about six weeks. A monthly dividend of $5 per share is declared to-day, payable next Thursday.

CROWN POINT.

Daily yield 580 tons. There is no particular change to note in the mine. It is looking finely at all points, and the lowest or 1300-foot level is opening out even better than was anticipated. The incline is progressing downward steadily in hard, dry rock, and the south drift at the 1400-foot level is making good progress. Everything in and about the mine is in excellent shape, and the receipts for March will foot up to over $1,000,000. The regular monthly dividend will probably be declared next Tuesday.

BUCKEYE.

The main drift east at the first station is in 180 feet, making good progress. The ore breasts at the first station south from the incline are holding out and yielding finely. The mill is kept steadily running on ore from the mine. At the annual meeting of the company, held in San Francisco on the 28th of March, the following Trustees were elected: A. K. P. Harmon (President), J. C. Flood, J. D. Fry, Seth Cook and Edward Barron; Secretary, Joseph Maguire; Superintendent, Daniel Cook.

CONSOLIDATED VIRGINIA.

Sinking the shaft is making the usual good progress, the rock in the bottom blasting well, and the work being pressed with all the vigor possible. The main north drift on the 1167-foot level from the Gould and Curry shaft is still driven energetically ahead to make the desired connection with the shaft at the earliest moment possible, as but little can be done in the way of extracting ore and opening out the mine for working purposes until that is accomplished.

CALEDONIA.

Prospecting and extracting ore from the main north drift at the first station continues without change. The main west drift at the 2nd station (500-foot level) is making good progress, the rock in the face blasting well. The Sapphire mill was started up on ore from the mine during the fore part of the week, but owing to a breakage of some of the machinery no returns have yet been made.

GLOBE.

The up-raise from the main-tunnel, to connect with the old upper works, is making steady progress, still following the line of the ledge, the face in good ore. This raise is now up 147 feet, at which point the ledge appears to lay much flatter than it did when it was first struck in the tunnel below. The company have about 150 feet more to raise to make the desired connection.

IMPERIAL.

Prospecting the lower levels continues with unabated vigor and much more favorable prospects of valuable developments than heretofore. Work on the new machinery is making steady progress, each piece being placed in position ready for work as fast as it arrives at the mine. Lowering and putting the pumps in position, ready for work in the shaft, is making fair progress.

OVERMAN.

The main west tunnel on the 1000-foot level is still pressed vigorously ahead, the rock in the face somewhat softer, and good progress being made. Two cross-cuts to tap the ledge at different points have been commenced, one diverging to the northward and the other to the southward from the main tunnel; the formation at the starting point indicating a near approach to the ore vein.

SILVER HILL.

Sinking the shaft is suspended for the present on account of the flow of water from the north drift at the second station. The water in the drift appears to be steadily decreasing, so that the sinking can soon be resumed. Cross-cutting the ledge in the north drift at the first station has just been commenced. No new developments to report.

JULIA.

The main west drift on the 1000-foot level is still driven vigorously ahead, making good progress, with no discovery of importance to chronicle, for the week. The south cross-cut on this level, along the vein of ore recently developed, is making good progress, the face still in good ore.

INDUS.

Timbering the station chamber and putting in the turn-tables for the purpose of running north on the ledge is nearly completed. The ledge at this point is eight feet in width, showing some very rich ore. As soon as the station is completed the work of extracting ore for milling will be commenced.

MINT.

The contract for drifting eastward from the shaft to the ledge was let, the water extracted, and the work fairly commenced during the fore part of the week. The drifting is making good progress. Some good developments may soon be looked for.

ALAMO.

Sinking the new shaft is making fair progress, the entire size of the shaft in good ore, showing plenty of rich sulphurets. The ledge continues very solid and hard, requiring continual blasting.

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, *as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is doubly valuable as a permanent means of keeping an advertisement before the public. It is the Organ of the* AMERICAN INSTITUTE OF MINING ENGINEERS, *and is regularly received and read* BY ALL THE MEMBERS AND ASSOCIATES *of that large and powerful society,* THE ONLY ONE OF THE KIND IN THIS COUNTRY. *It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country, and presents the very best means of reaching that very important class of men.*

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Nov 19:1y

TO COAL OPERATORS.

Proposals for the Sale or Lease of Coal Lands in Luzerne County.

PHILADELPHIA, April 15, 1873.

The undersigned hereby gives notice that he is prepared to receive proposals until June 1st. 1873, for the sale or lease of four tracts of land in the warrentee names of John Brady, Wm. Gray, Nathan Beach and Thomas Paschall, situate in Foster township, Luzerne Co., adjoining the lands of the Buck Mountain Coal Co., Sharp, Weisse & Co. and the Highland Coal Co., containing about 1400 acres. The right is reserved to reject any and all bids not satisfactory to the owners.

FRANKLIN FELL, Trustee,
April 22:5t. 120 South Front Street.

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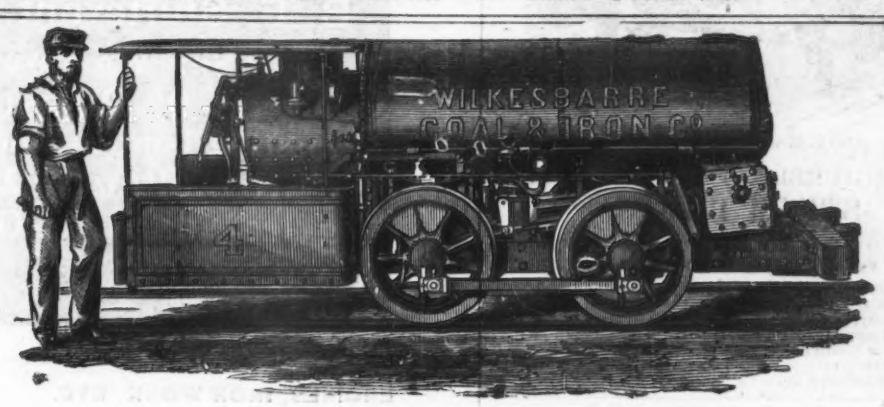

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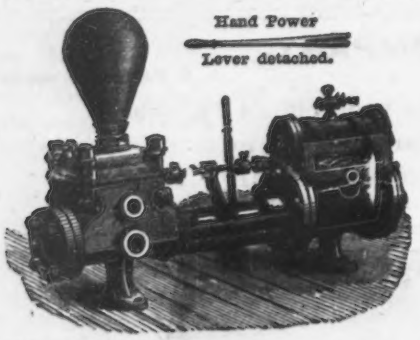

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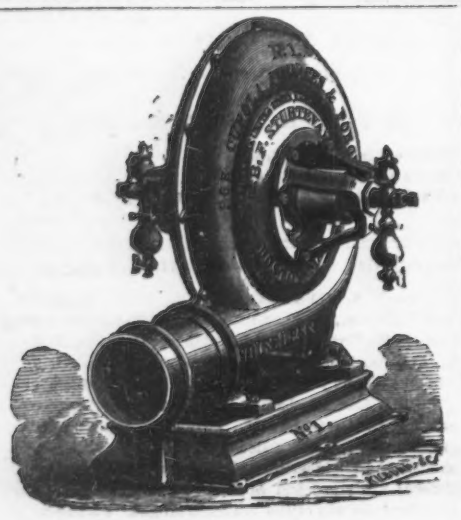

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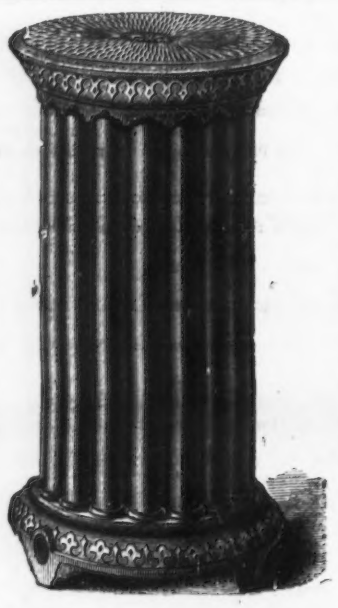

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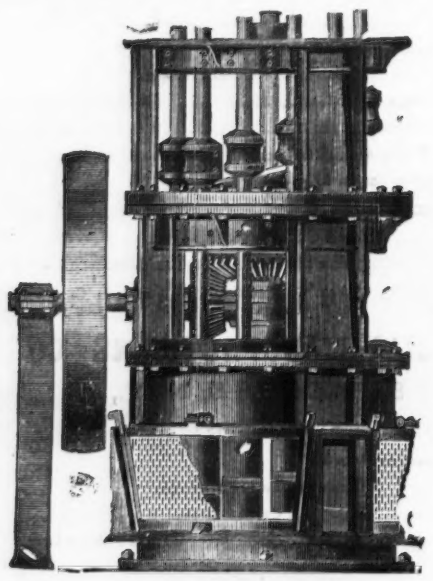

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of 12 stamps. It requires no frame to put it up. The best Battery ever used for amalgamating gold, or crushing silver ores, dry or wet. Can be put up on a mine in running order for one-half the price of the straight battery, and in three days after its arrival at the mine. 12-stamp battery, 20,000 pounds, with frame complete; 6-stamp battery, 7,000 pounds. Every mill run at shop before shipping.

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All the various styles of Pans, Amalgamators, Rock Breakers, Separators, Settlers, Concentrators, Dry or Wet, for working Gold, Silver or Copper Ores, the same as built in California and at lower prices. SHOES AND DIES made of the best white iron. Send sizes and we will make patterns and forward Shoes and Dies at low prices. Engines, Boilers and fixtures, and other Machinery made to order.

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Bar Iron, Braziers' Rods, Wire Rods, Rivet and Machinery Iron, Iron and Steel
Wire of all Kinds, Copperas
&c., &c.
RAILROAD IRON, COOPER WROUGHT IRON BEAMS AND GIRDERS,
Martin Cast-Steel, Gun-Barrel and Component Iron,
PUDDLED AND REFINED CHARCOAL BLOOMS,
Ringwood Anthracite and Charcoal Pig Iron.
Works at Trenton and Ringwood, N. J.
May 17:1y

MISCELLANEOUS.

THE SELDEN DIRECT-ACTING

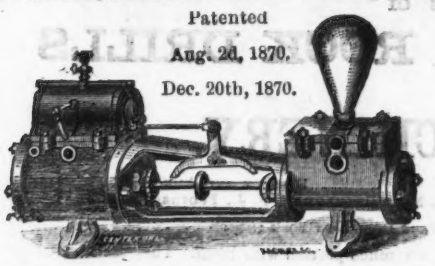
STEAM PUMP

A. CARR, Manufacturer & Proprietor.

Patented

Aug. 2d, 1870.

Dec. 20th, 1870.



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AS A MINING PUMP

It is unsurpassed. Also,

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(SUITABLE FOR WET PROCESS.)

1,000 Tons 5 per Cent Yield.

FOR SALE AT VERY LOW FIGURES.

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Schuylkill Copper Works,

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COPPER ORES WANTED.

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"SCHUYLKILL COPPER WORKS,"

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Jan. 14:6m PENNSYLVANIA.

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Solicits consignments and orders to purchase or sell American or Foreign Raw or Manufactured Irons.

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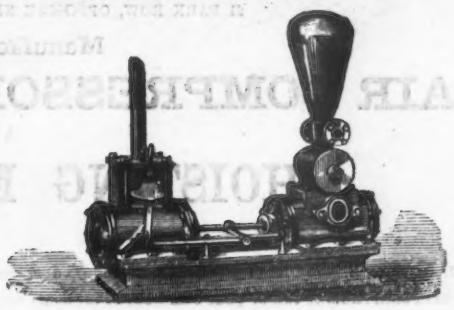
STEAM PUMPS.

Niagara Steam Pump Works.



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Steam Pumping Engines, Single and Duplex, Worthington's Patent, for all purposes, such as Water Works Engines, Condensing or Non-condensing; Air and Circulating Pumps, for Marine Engines; Blowing Engines; Vacuum Pumps, Stationary and Portable Steam Fire Engines; Boiler Feed Pumps, Wrecking Pumps,

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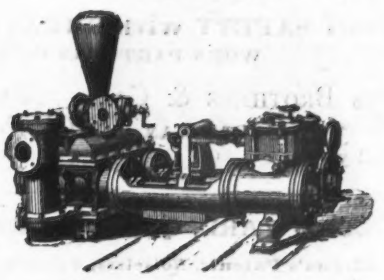

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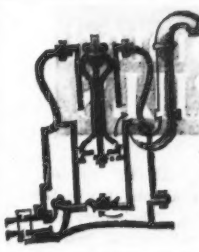

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Well Pumps,

AND PUMPS FOR ALL PURPOSES.

Simple, cheap, and effective.

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Patent Fly Wheel

STEAM PUMP,

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COMBINED.

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PHILADELPHIA,

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21 PARK ROW, OPPOSITE NEW POST OFFICE, NEW YORK.
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HOISTING MACHINERY.

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FOR MINES, BLAST FURNACES, PILE DRIVING, CONTRACTORS' USE, &C.
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Special adaptation for MINES and FURNACES.
Just Out—combining RAPIDITY of MOVEMENT, EASE of CONTROL and PERFECT SAFETY with GREATEST DURABILITY.
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FRICTION OR GEARED MINING AND QUARRY HOISTERS.
For Hoisting and Conveying Material to any Distance by Wire Cables.
Smoke-burning Safety Boilers. Oscillating Engines, Double and Single, ½ to 100 horse-power. Centrifugal Pumps, 100 to 100,000 gallons per minute. Best Pumps in the world; pass mud, sand, gravel, coal, grain, etc., without injury.
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